OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME 44, NO. 10
MAY 9, 1955

AMERICAN DYESTUFF REPORTER

Devoted to Textile Chemistry
BLEACHING • DYEING • PRINTING • FINISHING

COLORS that keep their bloom season after season

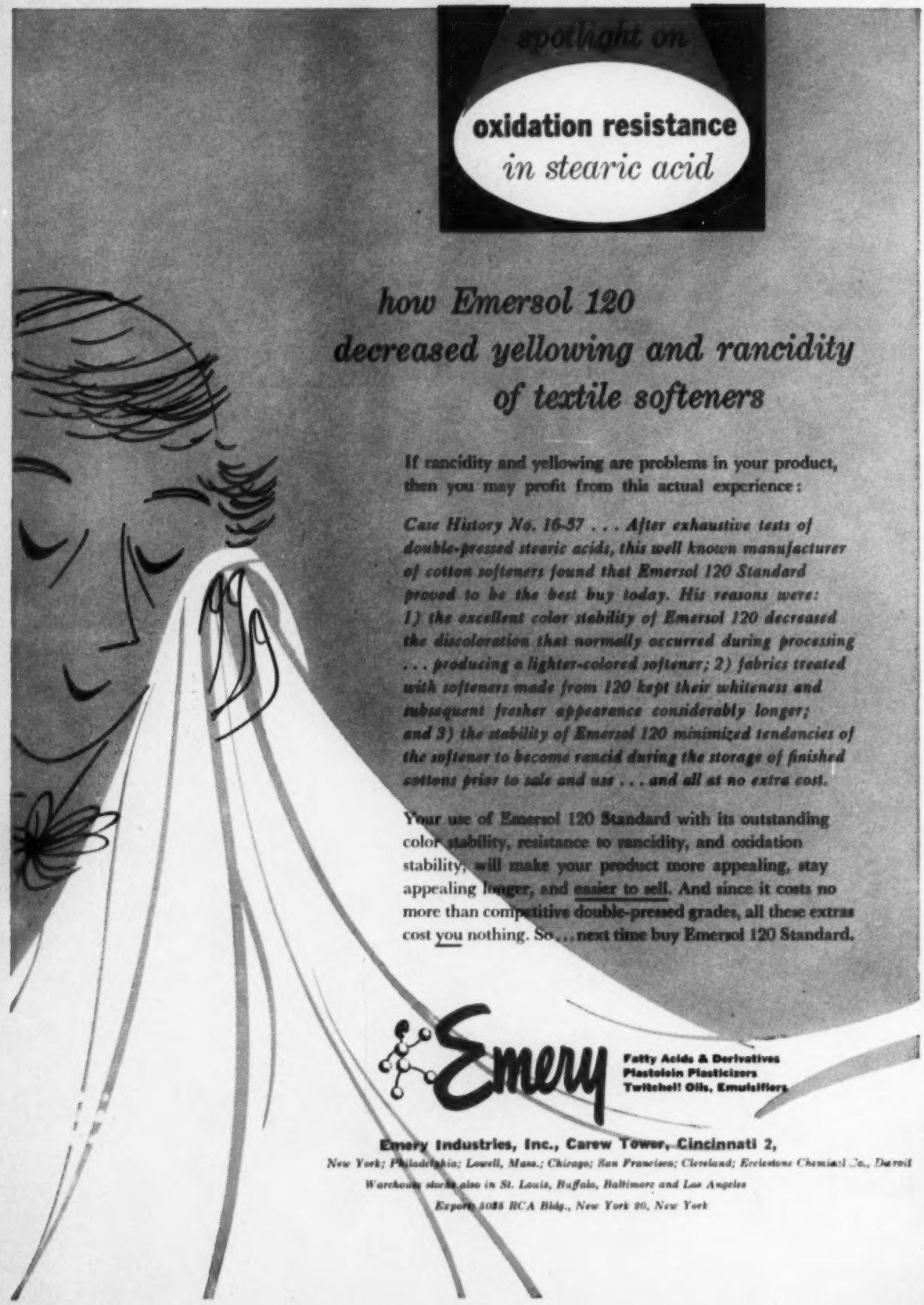
A perennial favorite is washable leisure wear, in an array of bright colors. But consumers expect these garments to be able to take lots of hard wear, sun and suds — without losing their color and fresh appearance.

Washable rayons and cottons dyed with uniform Du Pont vat dyes are sure to give exactly this kind of outstanding color performance.

Our technicians are always glad to help you in the proper choice and application of these superior vat colors; or to help you with any dyeing problems. Write to: E. I. du Pont de Nemours & Co. (Inc.), Dyes and Chemicals Division, Wilmington 98, Del.

Du Pont Dyes

DU PONT
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY



spotlight on

oxidation resistance
in stearic acid

how Emersol 120 decreased yellowing and rancidity of textile softeners

If rancidity and yellowing are problems in your product, then you may profit from this actual experience:

Case History No. 16-57 . . . After exhaustive tests of double-pressed stearic acids, this well known manufacturer of cotton softeners found that Emersol 120 Standard proved to be the best buy today. His reasons were: 1) the excellent color stability of Emersol 120 decreased the discoloration that normally occurred during processing . . . producing a lighter-colored softener; 2) fabrics treated with softeners made from 120 kept their whiteness and subsequent fresher appearance considerably longer; and 3) the stability of Emersol 120 minimized tendencies of the softener to become rancid during the storage of finished cottons prior to sale and use . . . and all at no extra cost.

Your use of Emersol 120 Standard with its outstanding color stability, resistance to rancidity, and oxidation stability, will make your product more appealing, stay appealing longer, and easier to sell. And since it costs no more than competitive double-pressed grades, all these extras cost you nothing. So . . . next time buy Emersol 120 Standard.

Emery

Fatty Acids & Derivatives
Plastolein Plasticizers
Twitchell Oils, Emulsifiers

Emery Industries, Inc., Carew Tower, Cincinnati 2,
New York; Philadelphia; Lowell, Mass.; Chicago; San Francisco; Cleveland; Ecclestone Chemical Co., Detroit
Warehouse stocks also in St. Louis, Buffalo, Baltimore and Los Angeles
Export 5035 RCA Bldg., New York 20, New York

Now is the time to consider how you can

spruce up your back to school wear with new

*LENRA DYES

for

†ARNEL

TRIACETATE

As Arnel begins to go places, A.A.P. proudly presents its new **LENRA DYES,** a selected group of disperse type colors designed to help you make the most of the outstanding properties of this exciting new fiber. To start off right with Arnel, start with the research-proved colors which help keep Arnel washable and are stable to the heat setting conditions which make Arnel wrinkle-resistant and glaze-resistant.

Intensive tests by the A.A.P. research laboratory have demonstrated the all-around suitability of **LENRA** colors for the dyeing and printing of Arnel. Available in a wide range of brilliant and beautiful shades, the **LENRA** group offers excellent fastness to washing . . . light . . . and sublimation.

Many of the **LENRA** colors are presently being used satisfactorily by Celanese Corp. of America, the makers of Arnel Triacetate fiber.

For full details and working samples, consult our nearest branch. An informative A.A.P. manual on the dyeing of Arnel is available. We invite you to request a copy now.

*Trade Mark Reg. Pending
†Trade Mark

AAP

AMERICAN ANILINE PRODUCTS, INC.

The Standard of Color Perfection

SINCE

1876

Camel

TEXTILE

Dyes

Three-quarters of a century has built the name of Camel into a symbol of dependability for textile dyestuffs—75 years of uninterrupted service to the industry as a background of experience for prompt, efficient attention to all textile dyestuff requirements and problems.

Refer your dye problems to our laboratories . . . capable, experienced engineers are ready to serve you.

John Campbell and Company

75 HUDSON ST., NEW YORK CITY—BArclay 7-6228

2520-22 N. BROAD ST., PHILA. 32, PA.—RAdcliff 5-7103

BRANCH OFFICES & WAREHOUSES: BOSTON • EAST CLEVELAND, OHIO • ATLANTA, GA.

American Dyestuff Reporter, Vol. 44, No. 10, May 9, 1955. Published every other Monday. Copyright 1955, by Howes Publishing Co., Inc., 44 E. 23rd St., New York 10, N. Y. Domestic subscription. $7.50; Canadian. $8.50; Foreign, $15.00. Effective Dec. 1, 1954. Entered as second-class matter Nov. 6, 1919, at the New York, N. Y., Post Office under the act of March 3, 1879.

for your immediate requirements

made by

Hilton-Davis

Samples and information on request from:

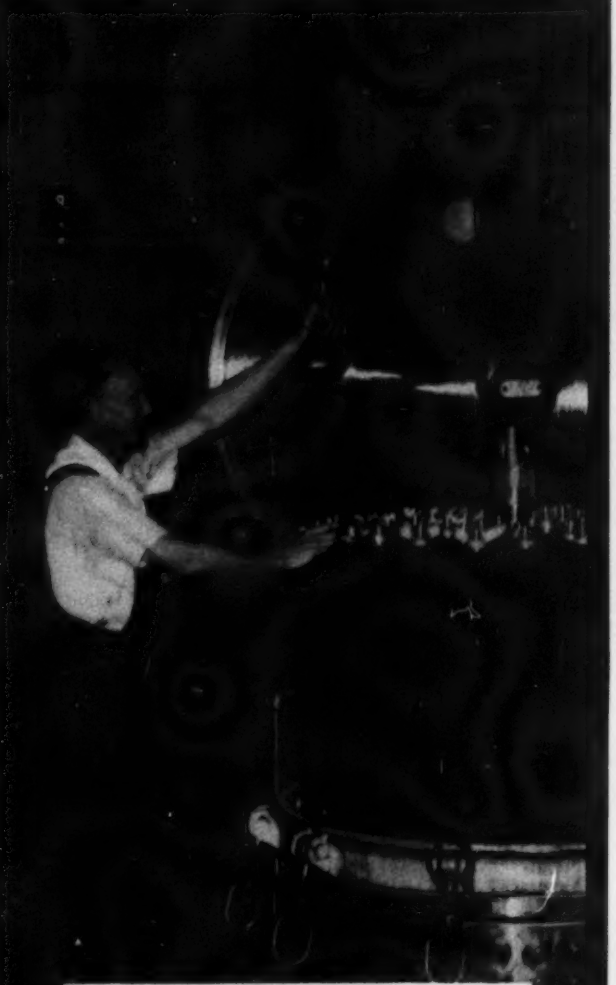
- THE HILTON-DAVIS CHEMICAL CO.
  Greenville, South Carolina
- THE HILTON-DAVIS CHEMICAL CO.
  Providence, Rhode Island

THE HILTON-DAVIS CHEMICAL CO. DIV.

2235 LANGDON FARM ROAD, CINCINNATI 13, OHIO

Armour Energetic® cuts crocking and costs at Standard-Coosa-Thatcher..

..and will at your mill!



Standard-Coosa-Thatcher uses Energetic to minimize crocking on this naphthol-dyed yarn—and for maximum detergency and economy in other dyeing and bleaching processes.

"None of the synthetics had solved our crocking problem—until we tried Armour Energetic. That did it, and we've been using Energetic successfully in our dyeing and bleaching processes for the past three years." These are the words of Mr. H. H. Eagar, manager of quality control and development for Standard-Coosa-Thatcher Company. Energetic has proven itself in his mill and in many, many others—why not try it in *yours?*

Here's how Energetic will cut costs for you! A powerful, concentrated nonionic synthetic detergent, Energetic is supplied 90% *active*—it takes only one pound to do the job of 3 full pounds of anionics. This adds up to a savings per job of about 21¢ with every pound of Energetic you use. And you can add builders to Energetic to cut costs even more.

Test Energetic now by this trial-order plan! Send the coupon for free test samples of Energetic and complete booklets on all three Armour Energetic products. Or, for quick delivery on a 5-gallon trial drum, place an order right in the coupon below. Start reducing your scouring problems and costs now!

FREE SAMPLE AND TRIAL ORDER BLANK

Armour Industrial Soap Department
Armour and Company, 1355 W. 31st St., Chicago 9, Ill.

Please send me:

- ☐ FREE! Sample of ENERGETIC
- _____ 5-gallon drums of ENERGETIC @ $13.86 each
- ☐ Free Booklet, ENERGETIC and ENERGETIC 5
- ☐ Free Booklet, ENERGETIC W-100 (Instant wetting agent)

☐ Bill me ☐ Check enclosed ☐ Money Order

Your money back if not completely satisfied. For refund, simply ship us unused portion.

Name _____ Title _____

Firm _____

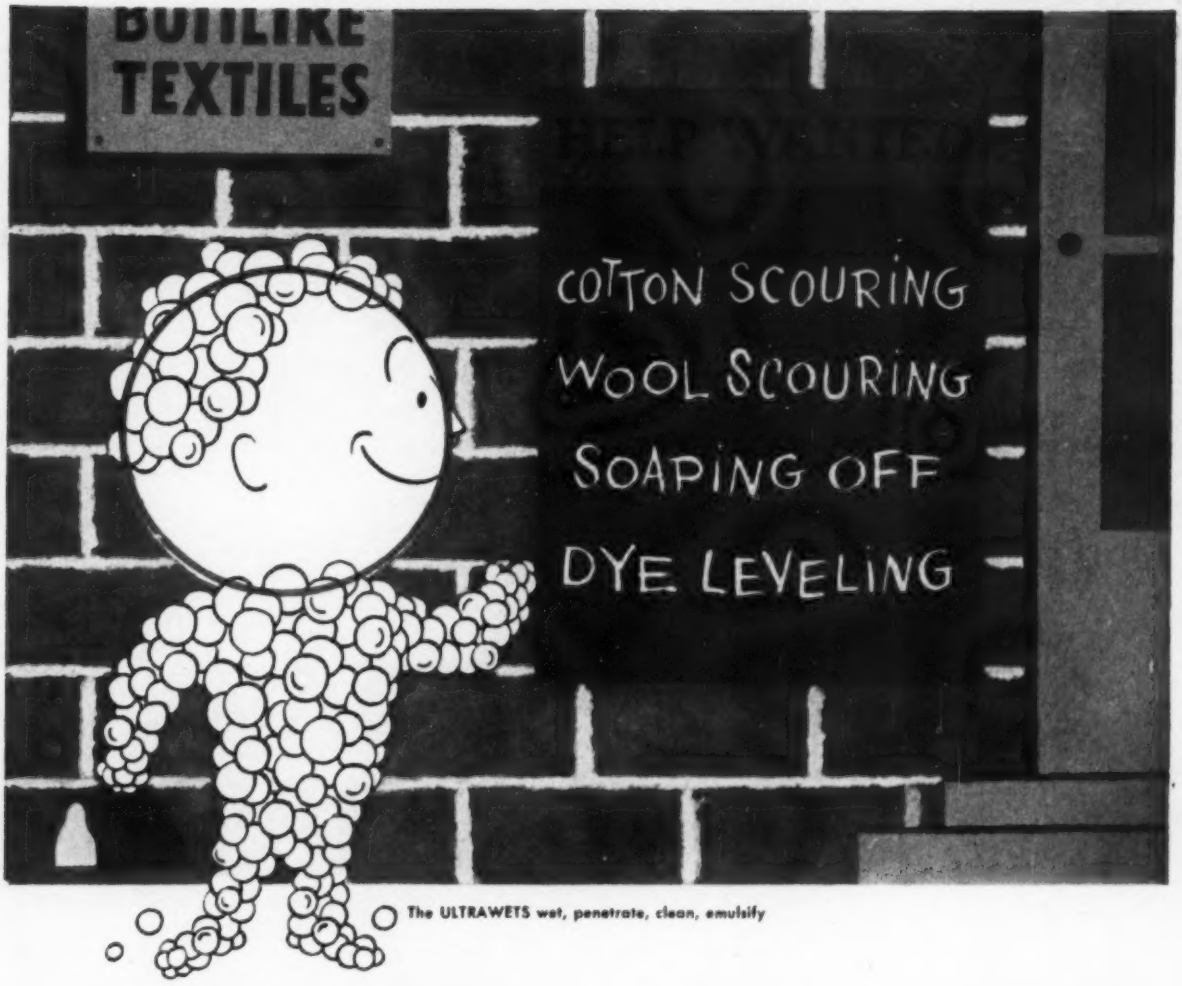
Address _____

City _____ Zone _____ State _____

ARMOUR

Industrial Soap Department

D3



The ULTRAWETS wet, penetrate, clean, emulsify

His skills can help you...in these tough assignments

Maybe the costs of your textile processing are running higher than they should. Maybe you're fighting the problem of hard water precipitates. Or stubborn stains that reduce product quality. Well, for these and numerous other problems, you can find up-to-the-minute answers in the ULTRAWETS. The ULTRAWETS offer you maximum performance at minimum costs.

Only economical low concentrations of ULTRAWETS are required for most applications. Because ULTRAWETS are surface active agents, with exceptional cleaning and wetting ability. They dissolve quickly in hard or soft water, hot or cold. ULTRAWETS speed penetration of liquids, hold solids in suspension, emulsify greases, and oils.

Investigate the advantages of the ULTRAWETS. Available as a flake or bead in drums and bags . . . or as a liquid, to give you easier handling, and the economy of bulk shipments. Our sales engineers can work with you to help determine the formulations that will give the best results. For information, send coupon or write.

Philadelphia,
Providence, Charlotte, Chicago

In the West:
L. H. Butcher Co.

In Canada:
Naugatuck Chemicals Division of Dominion Rubber Company, Ltd.

In Europe:
Atlantic Chemicals SAB
Antwerp, Belgium

ATLANTIC
PETROLEUM
CHEMICALS

THE ATLANTIC REFINING COMPANY
Dept. F-5, Chemical Products Sales
260 SOUTH BROAD STREET, PHILADELPHIA 1, PA.

Please send me information on the ULTRAWETS for use in ☐ Cotton Scouring, ☐ Wool Scouring, ☐ Soaping Off, ☐ Dye Leveling.

Name _____

Firm _____

Street _____

City _____ State _____

News about

B. F. Goodrich Chemical *raw materials*

new crease-resistant finishes give superior strength characteristics

HERE is a new way to make cellulosic fibers more resistant to crease, yet avoid undesirable side effects. Standard treatment with urea-formaldehyde resins —while it does its primary job well—results in weakened fabrics.

Modifying the U-F resins with Hycar latex makes a big difference. Tests show that cottons and rayon-acetate fabrics treated with U-F/Hycar have markedly better tear, breaking, and bursting strengths, compared with fabrics treated with U-F resins alone.

There are other important benefits: Abrasion resistance is increased, colorfastness of many dyes is improved. Fabric life is increased and yellowing reduced compared to straight U-F, because a U-F/Hycar blend retains less chlorine, both in treatment and in subsequent laundering.

Hycar latices offer many other benefits to textile manufacturers and finishers. For information that may help you upgrade a product or sharpen its sales appeal, please write Dept. CQ-6, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company

A Division of The B. F. Goodrich Company

Hycar

Reg. U.S. Pat. Off.

American Latex

GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

What is BECCO service to the Textile Industry?

It is Peroxygen Chemicals...

Becco hydrogen peroxide for bleaching cotton, wool, animal fibers (including cashmere), synthetics and blends, and for dyestuff oxidation; Becco peracetic acid for bleaching many synthetics and blends; Becco ammonium persulfate for oxidation of sulfur dyes; sodium perborate for dye development.

It is Processes...

Continuous bleaching, continuous knit goods bleaching, kier bleaching, package machine bleaching, Becco cold bleaching (patented), processes for bleaching with peracetic acid ... these and other processes owe much of their development to Becco research.

It is Delivery...

Becco chemicals are manufactured, stored and shipped to reach Becco customers in perfect condition by tank car, truck or in drums from numerous filling stations and warehouses so located as to assure prompt delivery.

It is Technical Service...

Becco has modern laboratories, a large research staff, chemists for research or consultation in your plant. Representatives throughout the country are trained technical men.

It is Technical Literature...

Among interesting Becco bulletins available on request are:

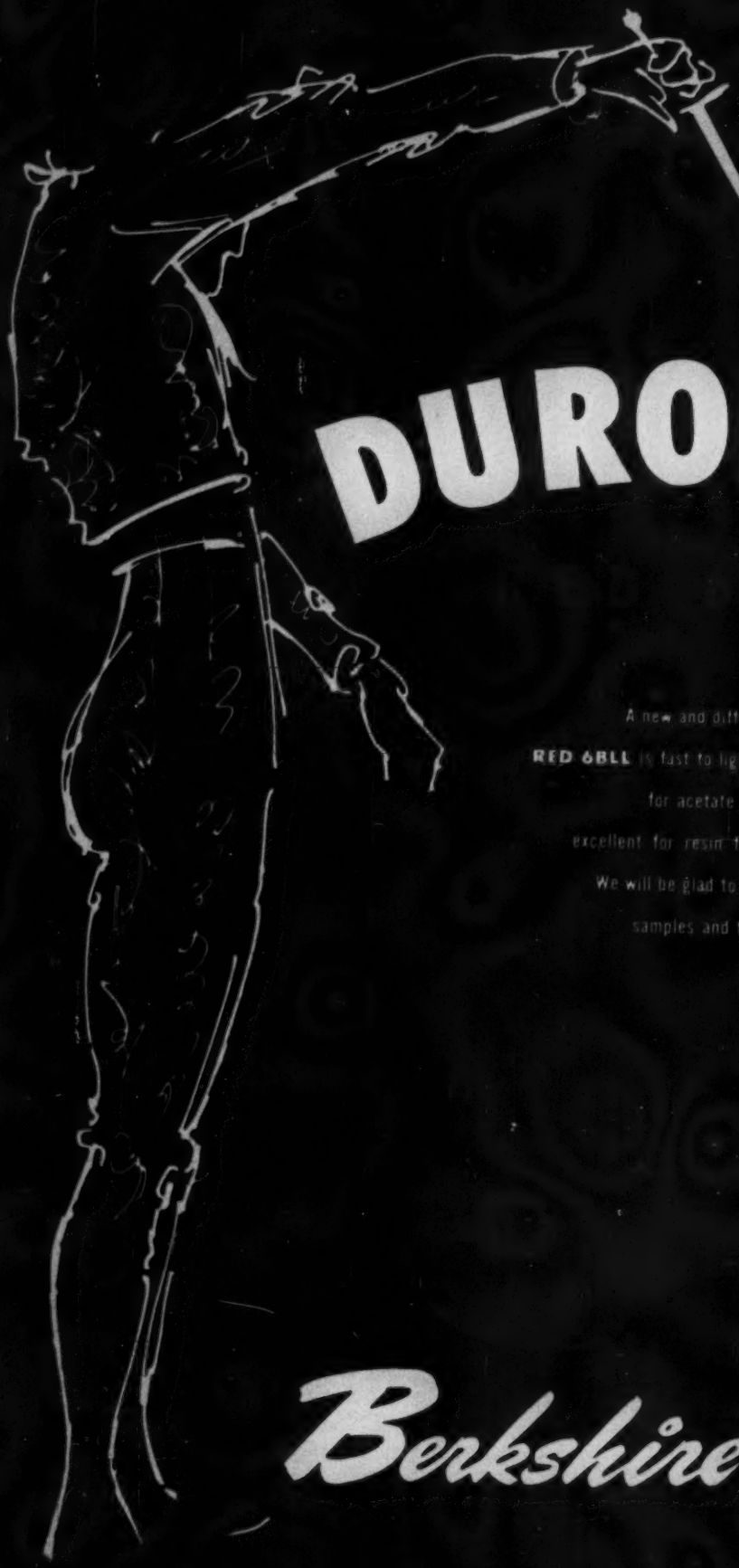
2. Hydrogen Peroxide
4. Peracetic Acid 40%
29. Hydrogen Peroxide Dry-In Process for Bleaching Wool
30. Hydrogen Peroxide in the Manufacture of Viscose
35. Modification of Wool with Peroxygen Compounds
38. Oxidation of Vat Dyes on Cotton and Synthetics with Hydrogen Peroxide
52. Bleaching with Some Peroxygen Chemicals
53. Fluorescent Agents in Hydrogen Peroxide Bleaching of Knit Goods
60. Successful Bleaching of Types 670 and 200 Nylon
61. Knit Goods Bleaching Range

Write for Becco Technical Bulletins by number, or for Becco's Bulletin List.

BECCO CHEMICAL DIVISION

FOOD MACHINERY AND CHEMICAL CORPORATION

STATION B, BUFFALO 7, N. Y.
BUFFALO • BOSTON • CHARLOTTE • CHICAGO
• NEW YORK • PHILADELPHIA • VANCOUVER, WASH.



DUROFAST

A new and different type **DUROFAST RED 6BLL** is fast to light and washing, useful for acetate and nylon reserves. It is also excellent for resin finishes.

We will be glad to send color cards, samples and technical data without obligation.

Stocks maintained at
CHARLOTTE · GREENVILLE
CHARLESTON and LOS ANGELES

Berkshire COLOR & CHEMICAL CO.

Manufacturing and Executive Offices

DELAWANNA, N. J.

210 Albany Street, SPRINGFIELD 5, Mass.

Canadian Representative: Thomas Boston, 4577 Melrose Ave., MONTREAL, Quebec

brighter shades of improved fastness

Cuprophenyl Green BL • Cuprophenyl Brilliant Blue 2 BL • Cuprophenyl Violet 3 RL • Cuprophenyl Rubine RL

Four valuable colors that will produce bright shades on cottons and rayons with good resistance to washing, perspiration and light. Fastness is fixed by a simple aftertreatment with copper sulphate and acetic acid or with Gycofix 67.

Geigy

"Cuprophenyl" and "Gycofix" are Geigy registered trademarks.

for fashion shades IRGALAN colors *always*...

"IRGALAN" is a Geigy registered trademark.

GEIGY DYESTUFFS
DIVISION OF GEIGY CHEMICAL CORPORATION
[illegible] BARCLAY STREET, NEW YORK 8, NEW YORK

Geigy

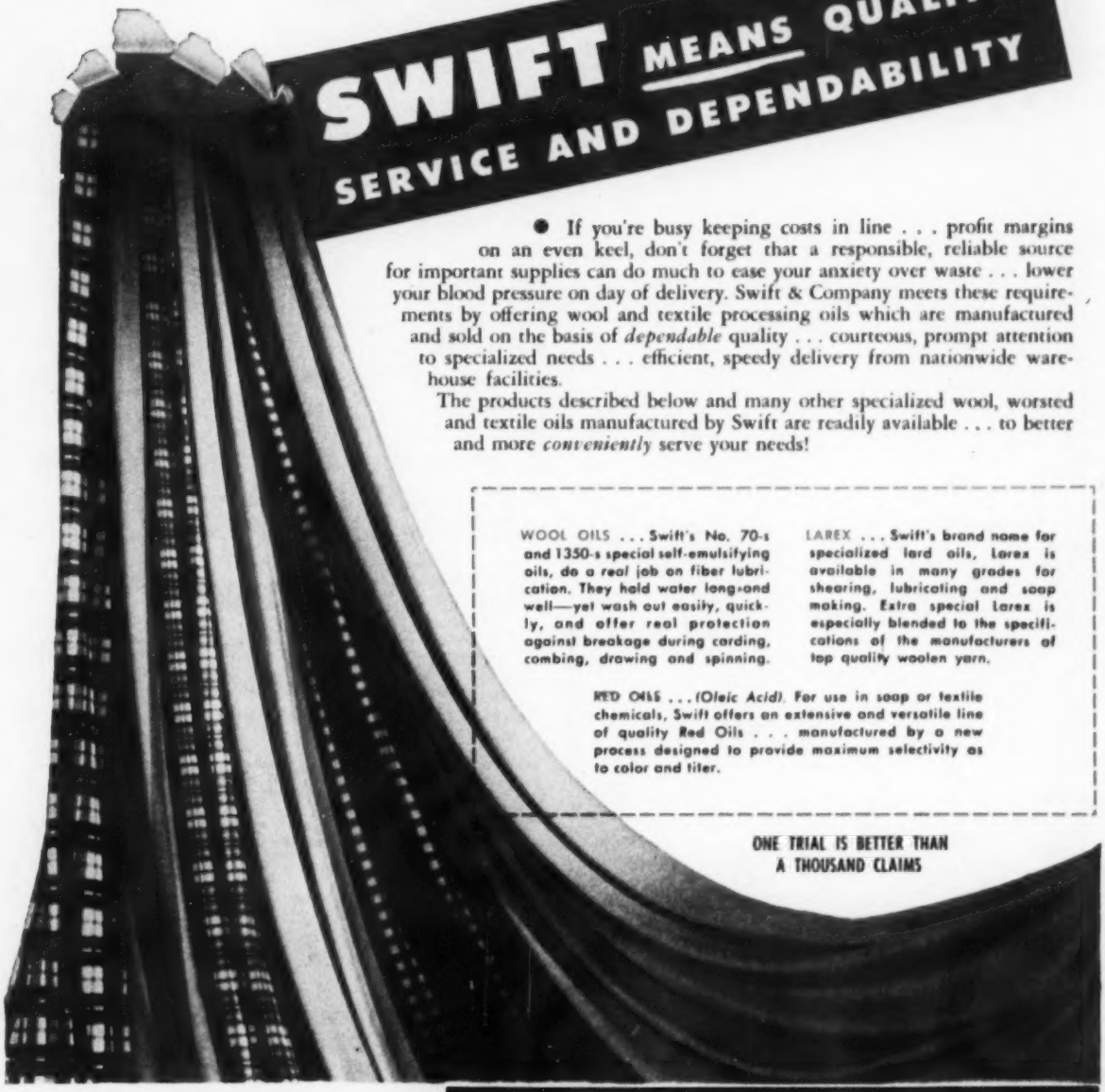
dyestuff makers since 1859

BRANCH OFFICES: BOSTON · CHARLOTTE, N. C. · CHICAGO · LOS ANGELES · PHILADELPHIA
PORTLAND, ORE. PROVIDENCE TORONTO IN GREAT BRITAIN: The Geigy Co. Ltd. Manchester

simplify the most difficult hues because they work consistently and harmoniously in combinations. Usually difficult fawns, taupes, browns and greys are achieved and reproduced from batch to batch since the Irgalans provide base colors which eliminate the use of radical shading elements. In addition, shortened dyeing procedures minimize the change from the original quality, texture and strength of the fibre. The neutral-drawing, metallized Irgalans are level-dyeing and are high in light and wet fastness . . . perfect colors for fashion fabrics of wool, silk or nylon.

PRINTED IN U.S.A.

FOR WOOL PROCESSING OILS...



SWIFT MEANS QUALITY SERVICE AND DEPENDABILITY

● If you're busy keeping costs in line . . . profit margins on an even keel, don't forget that a responsible, reliable source for important supplies can do much to ease your anxiety over waste . . . lower your blood pressure on day of delivery. Swift & Company meets these requirements by offering wool and textile processing oils which are manufactured and sold on the basis of *dependable* quality . . . courteous, prompt attention to specialized needs . . . efficient, speedy delivery from nationwide warehouse facilities.

The products described below and many other specialized wool, worsted and textile oils manufactured by Swift are readily available . . . to better and more *conveniently* serve your needs!

WOOL OILS . . . Swift's No. 70-s and 1350-s special self-emulsifying oils, do a *real* job on fiber lubrication. They hold water long and well—yet wash out easily, quickly, and offer real protection against breakage during carding, combing, drawing and spinning.

LAREX . . . Swift's brand name for specialized lard oils, Larex is available in many grades for shearing, lubricating and soap making. Extra special Larex is especially blended to the specifications of the manufacturers of top quality woolen yarn.

RED OILS . . . (Oleic Acid). For use in soap or textile chemicals, Swift offers an extensive and versatile line of quality Red Oils . . . manufactured by a new process designed to provide maximum selectivity as to color and titer.

ONE TRIAL IS BETTER THAN A THOUSAND CLAIMS

Swift
CENTENNIAL
1855 1955
TO SERVE YOUR INDUSTRY BETTER

Another of Swift's Products for Industry

USE THIS COUPON FOR FURTHER INFORMATION

SWIFT & COMPANY, Industrial Oils Dept. O-3T rev.
1822 165th St.
Hammond, Indiana

Please send further information on Swift's wool and textile processing oils: Wool Oils ☐ Larex ☐ Red Oils ☐

Company_____

Address_____

City_____ Zone____ State_____

Your Name_____

DU PONT

AVITONE* T

SOFTENER

gives you fast, uniform rewetting

YOUR FINE TERRY TOWELING will have excellent hand and initial absorbency when you use "AVITONE" T, the softener with superior *rewetting properties.*

This superior rewetting property speeds up the "Sanforizing" treatment for all your fine cotton fabrics. In addition, "AVITONE" T gives a soft, full finish. It's an excellent napping assistant for cotton flannel fabrics.

You'll have no problems with discoloration or rancidity with aging when you use "AVITONE" T. And for your fabrics of "Dacron" polyester fiber and blends with "Dacron", "AVITONE" T with its leveling action has proved to be an excellent pasting agent for dispersed dyes used on these fabrics.

Look into this new Du Pont finishing agent. For complete information on "AVITONE" T, simply write to: E. I. du Pont de Nemours & Co. (Inc.), Dyes and Chemicals Division, Wilmington 98, Delaware.

DU PONT

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

AVITONE* T

SOFTENER

* Reg. U. S. Pat. Office

New

R-300

TEXTILE FINISH

REDUCES

FORMALDEHYDE AFTER-ODOR

TO THE

VANISHING

POINT

YET COSTS NO MORE THAN ORDINARY FINISHES...

GIVES FINEST QUALITY, DURABLE FINISH...

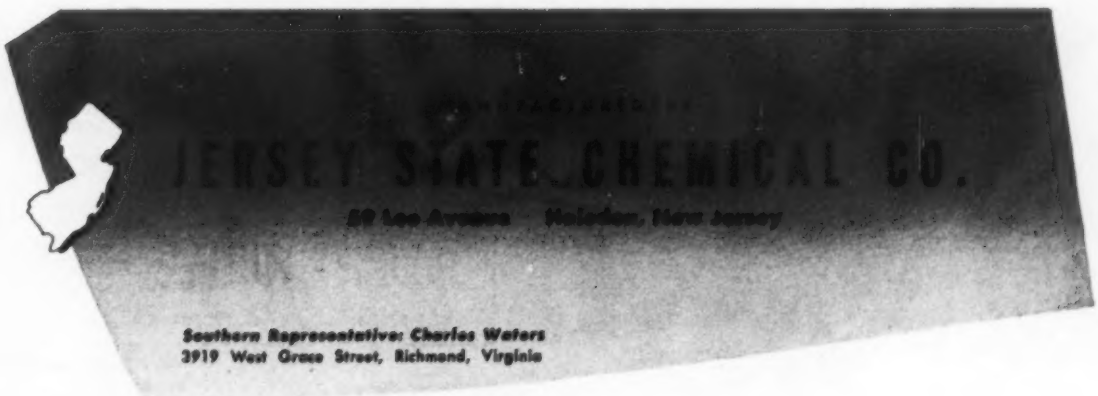
IMPROVED WASHABILITY... IMPROVED HAND...

R-300 Textile Finish – an important new development of Jersey State Chemical Co.– permits the finisher to substantially reduce objectionable formaldehyde after-odor *without increasing his costs.*

Priced in line with ordinary finishes, R-300 actually cuts formaldehyde odor in crisp finishing of nylons to a point where it is negligible – and at the same time reduces unpleasant formaldehyde odor in the finishing room.

None of the benefits associated with highest quality finishes is sacrificed in this improved type. In fact, R-300 gives *better* results in terms of finish, hand, durability and washability.

R-300 is applied in the same fashion as present finishes. Send for complete details today.



Fashion Moves To Prints

and leading textile printers use Jacques Wolf Printing Gums

Superclear Gum All Viscosities

Used for machine and screen printing of all types of textile fabrics. Produces bright prints with sharp outlines and very fine detail.

Gum Tragacanth Solution

Made by a patented process. Used with Acid, Direct or Insoluble Azo Dyestuffs for screen printing, this gum gives exceptionally clear, sharp prints.

Super Gum H

Full flow for roller and screen printing application. High color value, easy to handle. Compatible with all colors. Effective in alkaline or acid medium.

Screen Gum W-1141-B

Used as thickener for Rapidogen and Indigosol type dyestuffs. Good color value; excellent mark and washes easily.

the textile industry's best source, the country's largest importer and exporter of gums. Jacques Wolf products and services can surely be adapted to your operation—to improve your processing techniques, reduce costs, or actually give you a great variety of unseen benefits.

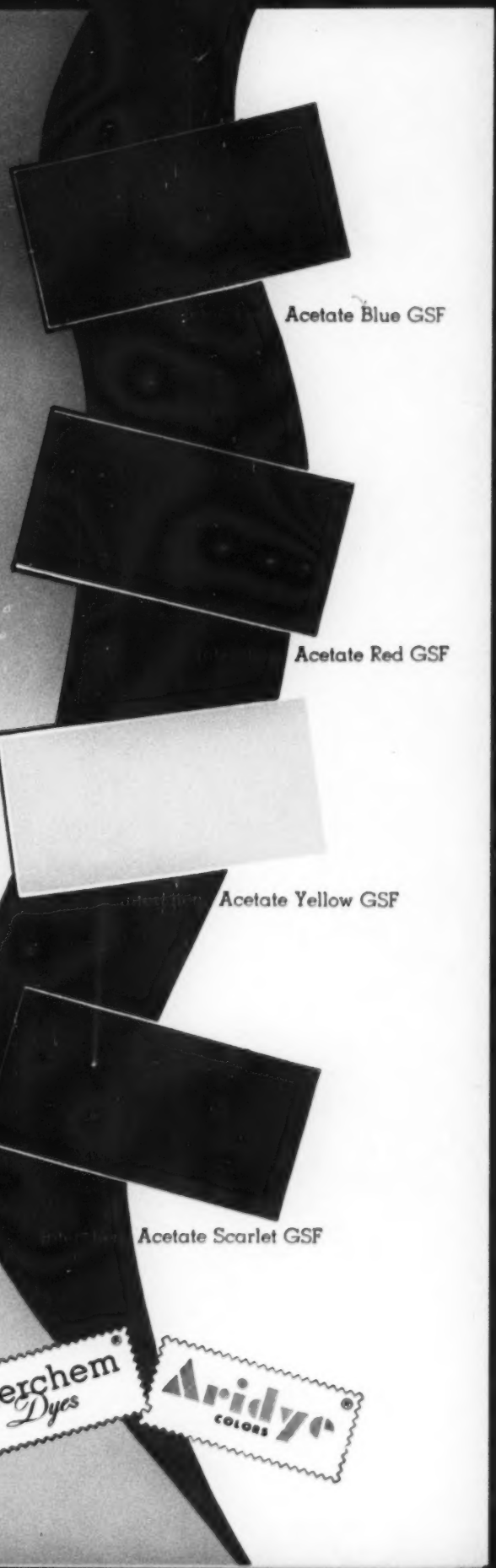
Vat Gum 80 XX

For application and discharge printing of vat colors. Has necessary balance of sulphoxylates, carbonates and hygroscopic agents plus converted thickeners to assure high color value.

For test samples and additional information without obligation, write

JACQUES WOLF & CO.
Chemicals PASSAIC, N. J.

Plants in: Clifton, N.J., Carlstadt, N.J., Los Angeles, Calif.



PROVED...

with the new GSF Series of Interchem Acetate Dyes

You can dye or print acetate fabrics in gas-fast, sun-fast shades from pastels to blacks. For best results use these new Interchem Acetate GSF Dyes for dyeing or printing dress goods, suitings, sportswear, beachwear, and other high quality fabrics.

WANT SATISFIED CUSTOMERS?

... Just write or phone the Textile Colors Division office nearest you for complete information on the new Interchem Acetate GSF Dyes.

Interchemical Corporation
Textile Colors Division

Pawtucket, R. I. HAWTHORNE, N. J. Rock Hill, S. C.

A LONG LIFE... AND A FAST ONE...

SUPRALANS

FOR WOOL AND NYLON

for

- unvarying reproducibility of shades
- good to very good light and wet fastness
- shorter dyeing time

The simplicity of the neutral dyeing method of application yielding level fast shades without the aid of a leveling agent now permits wool dyers to achieve results in quality which were not possible prior to the introduction of SUPRALANS.

Better tensile strength, preservation of fibre texture, equal exhaustion properties and uniformity of shade on various types of wool are assured factors which can be assumed with SUPRALANS.

A few minutes conversation with GDC technical and sales representatives will serve to convincingly explain the exceptional dyeing characteristics of SUPRALANS.

GENERAL DYESTUFF COMPANY

. . . impart
the Softness of the Spring air
to your DACRON* and DACRON blends
with AHCOVEL† E
or AHCOVEL 346
. . . and retain this softness even after
repeated launderings . . . outstanding resistance
to yellowing . . . for application by
pad or substantive methods to Dacron,
Dacron and cotton or Dacron and wool blends.
Write for more information
*Du Pont's trade-mark for its polyester fiber
† Arnold, Hoffman trade-mark
AHCO PRODUCTS
ARNOLD, HOFFMAN
PROVIDENCE • RHODE ISLAND
Associated with Imperial Chemical Industries Ltd., London, England
ARNOLD, HOFFMAN & CO., INCORPORATED • EST. 1815 • PROVIDENCE, R. I.
Offices and Sales Service Laboratories: Providence, R. I.
Atlanta, Ga., Charlotte, N. C., Teterboro, N. J.

WARREN FABRICS Company, Inc.

SALES OFFICE, 989 SIXTH AVENUE
NEW YORK 19, N.Y.

WEST WARREN, MASS.
PHONE: WARREN 41

April 2, 1955.

REPLY TO West Warren, Mass.

Mr. Harry G. Olsen,
Textile Sales Manager.
Taylor Instrument Companies
Rochester, New York

Dear Mr. Olsen:

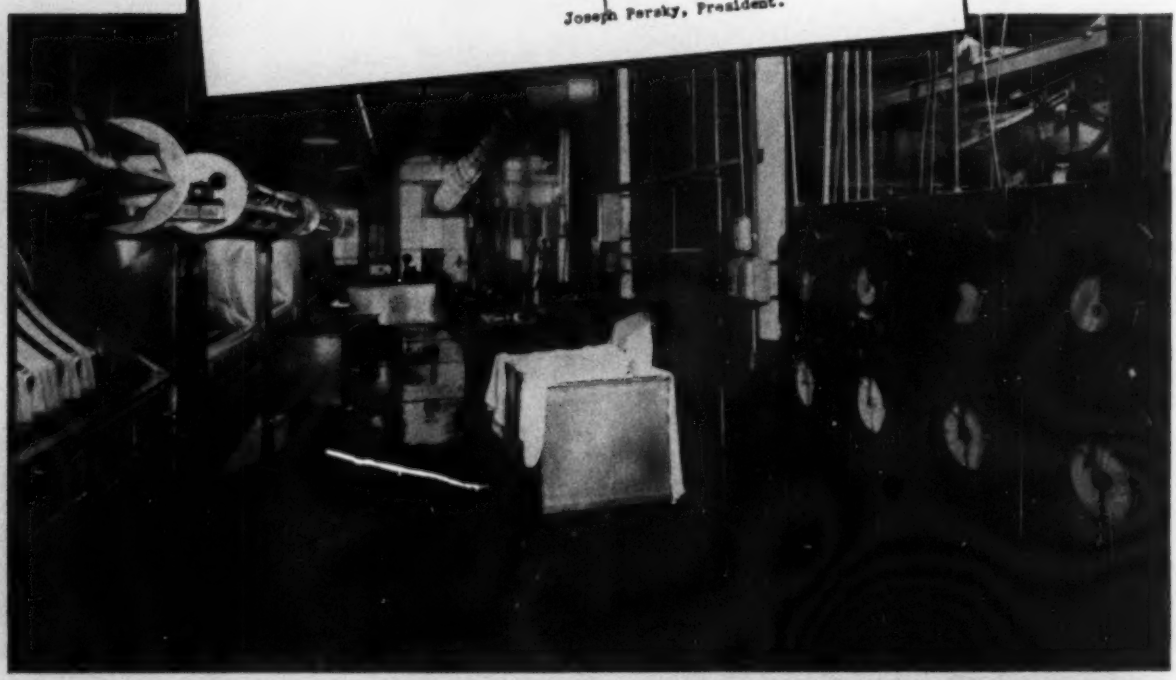
We could not help but write you and express our satisfaction with the operation of your FULFLEX Time Cycle Controllers. We did not really appreciate these instruments until we commenced the knitting and dyeing of synthetics.

Dyeing of synthetics is an extremely difficult operation and there is no question but that without TAYLOR controls we could not otherwise maintain the accurate and precise control which is so necessary in our operations.

You may rest assured that TAYLOR controls will remain a number one necessity to our business in the years ahead.

Very truly yours,

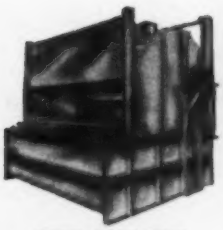
Joseph Persky, President.



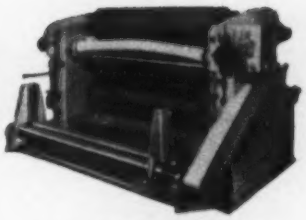
THERE are at least 25 different ways in which Taylor controls can help cut costs and maintain quality in the Textile industry. Your Taylor Field Engineer can advise you or, if you prefer, write direct to Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Taylor Instruments
MEAN ACCURACY FIRST

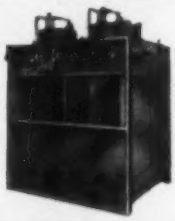
THE WIESNER-RAPP Co. Inc.
W-R
Buffalo, New York



MODEL A DYE-BECK

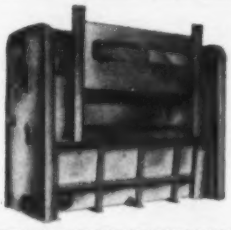


3-ROLL PADDER, MODEL A-14

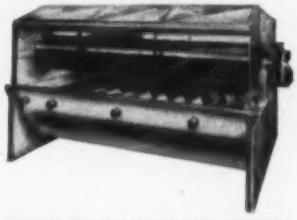


No. 450 MULTI-STAGE WASHER

ROPE SATURATOR



MODEL A-20 TIGHT STRAND WASHER



MODEL WR SLACK STRAND WASHER

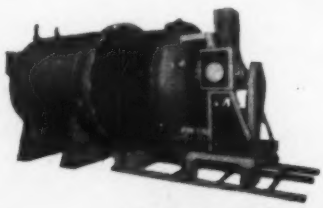
CONSULT WIESNER-RAPP FOR TEXTILE FINISHING MACHINERY

Close co-operation with the Textile and Chemical Industries has made Wiesner-Rapp specialists in the manufacture of stainless steel processing machinery and equipment. Wiesner-Rapp machines are functionally designed and generously proportioned, making them economical to operate and maintain. They find wide usage in continuous-volume production processes, although batch and laboratory type machines also are available. Throughout the years, mill operators have found they can rely on Wiesner-Rapp equipment because it is well-engineered and well made.

Other Wiesner-Rapp Products

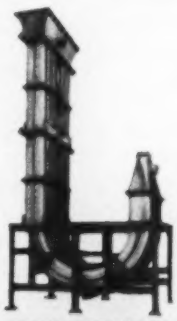
LABORATORY BAROTORS • BLEACHING RANGES • PIECE DYE KETTLES SKEIN DYE MACHINES • PLAITERS • CARRIER REELS • OPEN WIDTH SATURATORS • SQUEEZE ROLL EXTRACTORS • OPEN WIDTH WASHERS • DRY CANS •

The W-R technical staff is ready to discuss your processing problems.



BAROTOR

OPEN-WIDTH TREATING MACHINE



BECCO TYPE J-BOX

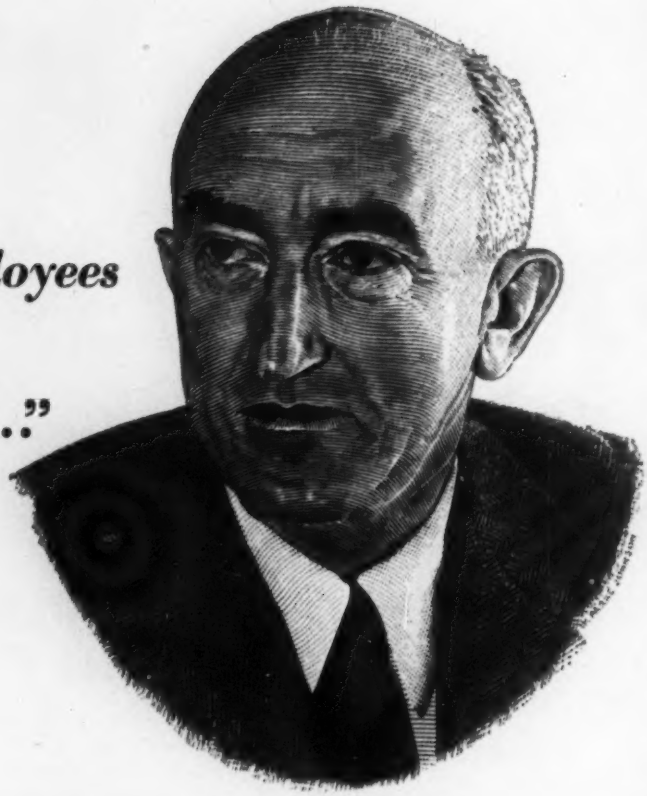
DUPONT TYPE J-BOX

THE **WIESNER-RAPP** CO., INC.

1604 SENECA ST., BUFFALO 10, N. Y.

Manufacturers of Wet-Finishing and Dyeing Machinery

"Boeing's 59,000 employees feel closer to the company..."



WILLIAM M. ALLEN
President
Boeing Airplane Company

"Boeing's 59,000 employees feel closer to the company since our recent successful person-to-person payroll savings drive in the Seattle and Wichita Divisions. Through letters and personal observations many employees have told us they have a greater sense of being a part of the company—that Boeing is interested in the welfare of each and every man and woman on the payroll."

That's the way it is with Payroll Savers. With the realization that systematic investment in U. S. Savings Bonds is a sure road to the down payment on a home, comfortable retirement, or other objectives, comes a better appreciation of a man's job and his company.

To most Payroll Savers, a day's absence from work means just that much out of his take-home savings. And he no longer takes chances, because he wants to stay off the accident list. He looks for better and quicker ways to do his job—promotion will mean more dollars for Savings Bonds. As a stockholder in America he takes a better interest in national affairs, the sound dollar, and economic stability.

91% of Boeing's 65,000 employees—more than 59,000 men and women—are Payroll Savers, as a result of a person-to-person canvass that put a Payroll Savings Blank in the hands of every Boeing employee. Certainly that is a high percentage of which Mr. Allen may well be proud. But it is not exactly unique. A number of the 45,000 companies which have the Payroll Savings Plan have 90% participation; many are in the 80% to 90% group, and many more are in the 60%, 70%, 80% class. In every case, these high percentages followed a person-to-person canvass that put a Payroll Savings Application Blank in the hands of every employee.

If less than 60% of your employees are Payroll Savers, do something about it. A phone call, telegram or letter to "Savings Bond Division, U. S. Treasury Department, Washington, D. C.," will bring prompt assistance from your State Director, U. S. Treasury Department. He will help you install, or revitalize a Payroll Savings Plan, through a simple, person-to-person canvass which your employees will be glad to conduct.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

American Dyestuff Reporter

®Varkon FP
(POWDER)

Effective against CALCIUM – MAGNESIUM – IRON and other heavy metals such as COPPER, ZINC, etc.

- Highly effective in preventing iron stains
- Prevents iron from interfering with the efficiency of the bleach in peroxide bleaching
- Improves efficiency and foaming characteristics of soap and synthetic detergents in scouring operations
- Assists in obtaining a much better strip of chrome dyed materials

®Varkon M
(LIQUID)

Particularly effective against CALCIUM and MAGNESIUM

- Used with soap in extremely hard water, it improves efficiency, increases foaming
- In dyeing (particularly woolens) Varkon M helps produce brighter and cleaner shades
- As an additive to textile printing gums, prevents "lake development due to presence of calcium or other impurities in the gums"

®Varkon FL
(LIQUID)

Developed for the specific purpose of CHELATING IRON and other heavy metals under strongly alkaline conditions

- Prevents stains caused by iron in kier-boiling of cotton goods
- Results in improved whiteness and bottoming of the material
- Also useful in mercerizing, to prevent iron stains

Write for Technical Service Bulletins

ARKANSAS CO., INC.
Serving the Textile Industry for over 50 Years
NEWARK, NEW JERSEY

New Textile Dyeing Reagent

IT WILL PAY YOU . TO TRY STERLING TNA·5*

STERLING TNA-5 has been especially developed for textile dyeing to economically and efficiently produce better shades and finish.

TNA·5 is an efficient and economical replacement, pound for pound, for anhydrous sodium sulphate in a neutral dye bath.

TNA·5 is neutral, readily soluble in either cold or hot water.

TNA·5 eliminates dye precipitation, produces a good color yield, level shades and a soft finish.

TNA·5 can be used in a neutral dye bath when dyeing cotton, rayon or wool or any blend of these fibers, in the staple or piece goods.

TNA·5 can be used either in the dry fine granular form or automatically converted to fully saturated brine with the TNA-5 Dissolver.

TNA·5 is especially effective with Direct and Naphthol Dyes, it produces excellent crock fastness and clear brilliant colors.

INDUSTRIAL DIVISION
INTERNATIONAL SALT CO., INC., SCRANTON, PA.

SALES OFFICES
Atlanta, Ga. • Chicago, Ill. • New Orleans, La. • Baltimore, Md. • Boston, Mass. • St. Louis, Mo. • Newark, N. J. • Buffalo, N. Y. • New York, N. Y. • Cincinnati, O. • Cleveland, O. • Philadelphia, Pa. • Pittsburgh, Pa. Richmond, Va.

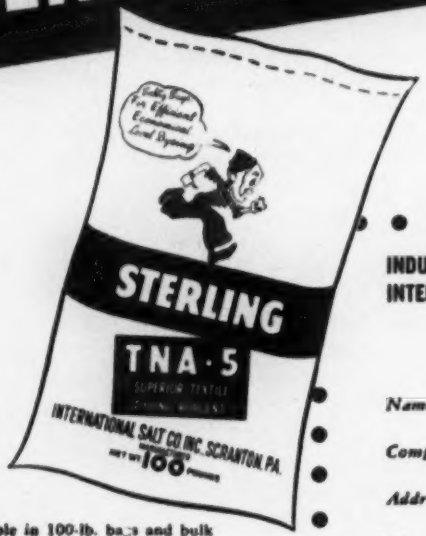
ENGINEERING OFFICES
Atlanta, Ga. • Chicago, Ill. • Buffalo, N. Y.

•

ORDER YOUR TNA-5 TODAY!
Or, if you want more information, send in this coupon!

*Trademark

STERLING TNA·5 Trademark



Available in 100-lb. bags and bulk

INDUSTRIAL DIVISION
INTERNATIONAL SALT COMPANY, INC., SCRANTON 2, PA.

☐ Please have a representative call.
☐ Please send additional information.

Name _____

Company _____

Address _____

City _____ *Zone* _____ *State* _____

Avoid this Complaint

for practical, profitable, permanent shrink proofing! use

HARTORESIN T

a dependable product for DURABLE stabilization of synthetic and cotton fabrics!

"Get these Plus Values!"

- ★ crush resistance without loading
- ★ a "hand" with customer appeal!
- ★ outstanding durability to laundering!
- ★ easy to use!
- ★ most textile men find — with HARTORESIN T—the expensive, time-consuming after-wash is no longer necessary!

HARTORESIN T — a genuinely outstanding development — provides lasting and complete shrink-and-crush-proofness for synthetic and cotton textile fabrics. A fabric stabilized for the life of its use is now a *reality!*

"Get to the HART of shrink-control — get HARTORESIN T!"

Save yourself time, worry, and money! Write, wire, or phone now for a sample. Proof is in performance. Top technical service and prompt delivery are assured.

HART PRODUCTS CORPORATION

1440 BROADWAY, NEW YORK 18, N. Y.

Works and Laboratories: Jersey City, N. J.

Hart Products Company of Canada, Ltd., Guelph, Ontario

But, Mr. Woolen Manufacturer,

You don't have to "live with" STATIC

NOPCO

PLANTS: Harrison, N. J.
Cedartown, Ga. • Richmond, Calif.

Many companies often make extravagant claims for their wool oils. Nopco doesn't believe in extravagant claims. But if you are one of the many woolen manufacturers who have been assuming that static is something you just have to live with—since you can't eliminate it economically—we're sure you have everything to gain by trying our new wool oil, Nopcostat 56-C.

Nopcostat 56-C is a wool oil about which we are, truthfully, extremely optimistic. The combination of built-in anti-static qualities for trouble free running *PLUS* supplemental detergent action for optimum finishing and fine, clean fabrics put Nopcostat 56-C in a class by itself.

But what we *say* about Nopcostat 56-C won't really convince you. One trial in your mill will, we are sure, prove to you that our great enthusiasm for this new wool oil is well deserved. Make us prove it!

Nopco Chemical Co.,
110 Fuller St., Harrison, N. J.

DRUSIL

NEW silicone finish ... better for all fabrics —even wool!

DRUSIL W
Proven by Performance

- Wool can now be treated without difficulty thanks to DRUSIL W. Its low curing temperature makes it possible. No added catalyst needed.
- Exclusive molecular structure, balanced formulation make DRUSIL W more stable and adhesive than any.
- DRUSIL W imparts durable moth resistance, improves abrasion resistance and tear strength.

These are some of the outstanding features that make DRUSIL W the best silicone finish.

Get the complete DRUSIL W story—Today.

Write or wire for your copy of DRUSIL W Technical Bulletin #DWA.

DREW PRODUCTS

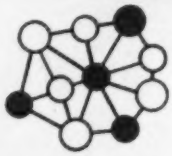
E. F. DREW & CO., INC.

15 East 26th Street, New York 10, New York

Textile Chemical Division

BOONTON, N. J. • CHICAGO 1 • BOSTON 10 • PHILADELPHIA 7 • GREENVILLE, S. C. • GREENSBORO, N. C. • IN CANADA—AJAX, ONTARIO

WICASETS AND **WICALOIDS** DEVELOPMENTS OF WICA, OFFER UNLIMITED RANGE OF APPLICATION. **WICASETS** ARE EMULSION POLYMERS AND CO-POLYMERS.



WICALOIDS ARE LATEX

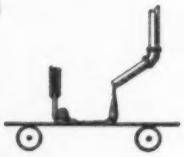
COMPOUNDS. BOTH ANSWER THE PROBLEMS OF THE WET

PROCESSOR OF WOVEN

AND NON-WOVEN FABRICS (SYNTHETIC AND NATURAL) AND WARP YARNS.

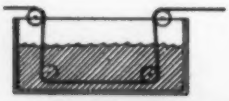
WICASETS AND **WICALOIDS** ARE USED IN ROLLER COATING,

PUDDLE COATING,



SPRAY COATING,

AND IMPREGNATION.



IDEAL IN WORKING WITH FLAT GOODS AND PILE FABRICS. **WICALOIDS** ARE USED ON JUTE, SISAL, AND RAMIE PADS. WICA'S RESEARCH

DEPARTMENT WILL SUPPLY YOU WITH THE ANSWER TO YOUR PROBLEM UPON REQUEST.

Wica

WICA CHEMICALS, INCORPORATED

OLD CONCORD ROAD • CHARLOTTE, NORTH CAROLINA

Here's washable wool!

Yes... Here's wool that really IS wool— and really, truly washable!

So, why be satisfied with wool substitutes when the REAL THING has EVERYTHING—elasticity, resiliency, "hand", texture, comfort, AND WASHABILITY—wool that will never shrink out of size, never mat or felt, never change in appearance *for the life of the fabric!*

● Schollerizing Prevents Shrinkage in Wool by Eliminating Matting and Felting ... a process that is safe, uniform and requires no extraordinary skills in its application.

Schollerized
WASHABLE WOOL
SAFE TO TUB • SAFE TO RUB

Get the details today as applied to YOUR wool product! Write:

*U.S. and foreign patents pending

Scholler

WRITE FOR ALL THE DETAILS OF SCHOLLERIZING AS APPLIED TO YOUR WOOL PRODUCT!

Manufacturers of Scouring, Dyeing and Finishing Materials; Soaps, Softeners and Sulphonated C

Naphthol AS-LG

Makes This Yellow Possible

It's Pfister's business to know, way ahead of time, what will click with your fashion-following customers.

Yellow produced with Pfister's Naphthol AS-LG is the last word in light-fast, wash-fast brilliance—the last word in demand-creating color for fast moving merchandise.

Get sample and formula from Pfister.

Pfister Chemical Works INC.

Ridgefield, New Jersey

NORMAN A. JOHNSON
Editor
CHARLES A. WHITEHEAD
Managing Editor
MYRON D. REESER
Business Manager
HERBERT A. STAUDERMAN
Advertising Manager
JAMES A. DOYLE
Promotion Manager
FRANCIS R. MURPHY
Production Manager
BERYL A. LAKNER
Circulation Manager

AMERICAN DYESTUFF REPORTER

Devoted to Textile Chemistry
BLEACHING • DYEING • PRINTING • FINISHING

OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

American Dyestuff Reporter was founded in 1917 and the Textile Colorist and Converter (formerly Textile Colorist) was incorporated with it in January, 1949. Published every other Monday by the **HOWES PUBLISHING COMPANY, INC.**, 44 E. 23rd Street, New York 10, N. Y. **C. R. Howes**, President; **Ernest J. Finan**, Executive Vice-President; **Norman A. Johnson**, Vice-President & Treasurer; **Myron D. Reeser**, Vice-President; **C. Essenbreis**, Secretary.

Telephone SPring 7-9364

Contents

VOLUME 44 MAY 9, 1955 NUMBER 10

• ***Proceedings of the American Association of Textile Chemists and Cloorists***

FEATURE ARTICLES

Some Notes on the Technology of the Single-Stage Continuous Bleaching Process..... P317
T E Bell, H D Terhune, H L Potter and M H Rowe

Spun-Colored Fibers P320
Geoffrey V Lund

Acrilan Dyeing P323
Walter H Hindle

Application of the THPC Flame-Retardant Process to Cotton Fabrics..... P328
John D Guthrie, George LDrake, Jr and Wilson Reeves

MISCELLANEOUS

AATCC Calendar P313
Activities of the Local Sections..... P313
Membership Applications P314
Photos of Speakers at Special Dyeing Course Given at PTI..... P314
AATCC Newsgram P316

• ***Departments***

Abstracts 333
News of the Trade..... 335
General Calendar of Coming Events..... 338
New Products and Developments..... 339
Names in the News..... 341
Technical Literature 342
Patent Digest 343
Paul Wengraf

Copyright, 1955, Howes Publishing Co, Inc
Contents of previous issues can be found by consulting the Industrial Arts Index and the Engineering Index, Inc. at your library

Color
styled for sales!

Brighter fresher colors stimulate sales. Give your new weaves and prints maximum sales impact by color-styling them with shades based on National Aniline Dyes.

Right now we can serve you better than ever before . . . with attractive new colors . . . expanded color research and application laboratory service . . . alert branch-office follow-through . . . nearby warehouse stocks.

Right now we can give you prompt service on matches, formulas and the dyes you need at every step from samples through mill runs to re-orders. Remember, you'll save time, effort and expense by calling National Aniline *first!*

National Aniline Dyes

NATIONAL ANILINE DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

Boston · Providence · Philadelphia · Chicago · San Francisco · Portland, Ore.
Greensboro · Charlotte · Richmond · Atlanta · Los Angeles · Columbus, Ga. · New Orleans · Chattanooga · Toronto

Ensemble by Monk

Proceedings of the

American Association of Textile Chemists and Colorists

Copyright, 1955, American Association of Textile Chemists and Colorists

Editor of Proceedings: Carl Z Draves

MAY 9, 1955

AATCC CALENDAR

(A general calendar of events may be found on page 338)

COUNCIL
June 17; Wednesday evening, Sept 21 (Chalfonte-Haddon Hall, Atlantic City, N J); Nov 18; Jan 20, 1956; Apr 20, 1956; June 15, 1956.

NATIONAL CONVENTIONS
Sept 22-24, 1955 (Chalfonte-Haddon Hall, Atlantic City, N J); 1956 (Waldorf-Astoria, New York); 1957 (Boston); 1958 (Chicago); 1959 (Washington, DC—tentative).

HUDSON-MOHAWK SECTION
May 20 (Ladies Night); June 24 (Annual Outing).

MID-WEST SECTION
June 11 (Annual Outing—Lake Lawn Lodge, Delavan, Wis); Oct 29 (Bismarck Hotel, Chicago, Ill).

NIAGARA FRONTIER SECTION
June 24 (Outing).

NEW YORK SECTION
May 20 (Kohler's Swiss Chalet, Rochelle Park, N J); June 17 (Outing—North Jersey Country Club, Wayne, N J).

NORTHERN NEW ENGLAND SECTION
June 10 (Annual Outing, Wachusett Country Club); Oct 14; Dec 9.

PACIFIC SOUTHWEST SECTION
June 3, Oct 7, Feb 6 (Gourmet Restaurant, Beverly Hills, Calif); Dec 2.

PHILADELPHIA SECTION
May 20 (Outing ——— Manufacturer's Golf & Country Club, Oreland, Pa); Oct 21 (Penn-Sherwood Hotel); Dec 2, Jan 13 (Kugler's Restaurant).

PIEDMONT SECTION
June 10-11 (Mayview Manor, Blowing Rock, N C); Oct 29 (Hotel Wm R Barringer, Charlotte, N C).

RHODE ISLAND SECTION
May 13 (Ladies' Night, Sheraton Biltmore Hotel, Providence); June 10 (Annual Outing, Pawtucket Country Club, Pawtucket, R I); Oct 13, Dec 1 (Johnson's Hummocks, Providence)

SOUTH CENTRAL SECTION
May 14 (Hotel Patten, Chattanooga, Tenn); July 29-30 (Lookout Mtn Hotel, Chattanooga, Tenn — pending); Dec 10 (Hotel Patten, Chattanooga, Tenn).

SOUTHEASTERN SECTION
June 3-4 (Annual Outing, Radium Springs, Ga); Sept 10 (Ralston Hotel, Columbus, Ga); Dec 3 (Atlanta Biltmore, Atlanta, Ga).

WASHINGTON SECTION
May 20 (U S Dept of Agriculture Auditorium, Washington, D C).

WESTERN NEW ENGLAND SECTION
May 13 (Ladies Night); June 17 (Annual Outing); Sept 16 (Rapp's); Nov 4 (Hartford, Conn); Dec 16 (Rapp's).

ACTIVITIES OF THE LOCAL SECTIONS

NIAGARA FRONTIER———Approximately 35 members attended the April 15th meeting of the Niagara Frontier Section, which was held at the Park Lane Hotel in Buffalo, N Y.

George L Baxter, AATCC vice president (Central Atlantic Region), gave a brief report on the activities of the national organization, after which Arnold Sookne, Harris Research Laboratories, Inc, delivered a paper on "The Chemical Structure and Useful Properties of Textiles."

During the business session, Bernard K Easton was elected Councilor pro tem, to replace J Edward Lynn, who has resigned from the Section.

Election of officers for the new term will be held at the October meeting.

* * * * * * *

MID-WEST———The Mid-West Section held its Spring Meeting on April 16th at the Netherland Plaza Hotel, Cincinnati, O.

40 members and guests attended the afternoon session, at which Harry Creegan, James Hunter Machine Co, discussed "Recent Improvements in Textile Processing Machinery".

At the evening session, which was attended by 83 members and guests, Chairman Arthur I Hultberg introduced Victor C Braun, Jr, the first recipient of the Section's Scholarship Award. This was followed by the showing of a film "Color in Industry", with narration by Nelson S Knaggs, The Hilton-Davis Chemical Co.

* * * * * * *

NEW YORK———The April 22nd meeting of the New York Section, held at Kohler's Swiss Chalet, Rochelle Park, N J, attracted a banner attendance of 320 as Fred Fortess, section head of dyeing and finishing research, Summit Research Laboratories, Celanese Corp of America, spoke on "Dyeing, Finishing and Heat Treatment of Arnel Triacetate." Considerable discussion followed the presentation.

The following nominating committee will report on its selection at the May 20th meeting of the Section: P J Wood, Royce Chemical Co, *chairman:* Harry Moore, Fair Lawn Finishing Co, and Jack M Schandler, Rohm & Haas Co.

* * * * * * *

PHILADELPHIA———The Philadelphia Section met on April 15th at Kugler's Restaurant, Philadelphia, Pa, with approximately 150 members and guests in attendance.

Chairman Frederick V Traut presented to Robert Bokum, director of the Evening School of the Philadelphia Textile Institute a check for $250.00. The check represented the amount of remaining monies from the course on "Theories of Dyeing," given by the Philadelphia Section's Educational Committee, with the cooperation of the Philadelphia Textile Institute, (See pages P315-6). Director Bokum stated in accepting the check that the Institute desired to continue the cooperation by offering additional courses in the fall of the year.

The meeting was then turned over to Carleton T Anderson, program chairman, who introduced the guest speaker of the evening, Jackson A Woodruff, American Viscose Corporation. Dr Woodruff spoke on "Piece Dyeing and Finishing of Rayon Tufted Floor Coverings."

* * * * * * *

WASHINGTON———"The Role of Government in the Textile Industry" will be the topic for a symposium at the May 20th meeting of the Washington Section at the U S Department of Agriculture Auditorium, Washington, D C.

Participating panelists will include G E Hilbert, director of utilization research of the Agricultural Research Services, U S Dept of Agriculture; W D Appel, assistant chief, Organic and Fibrous Materials Div, National Bureau of Standards; H H Hannah, chief, Division of Wool, Fur and Flammable Fabrics, Federal Trade Commission; and A H Thurston, chief, Textiles and Clothing Div, Office of Defense and Business Services Administration, U S Dept of Commerce.

A question and answer period will follow.

MEMBERSHIP APPLICATIONS

APRIL 22, 1955

SENIOR

Graham F Boswell—Dyer, Gann Hosiery Mills, Durham, N C. Section: (Pied) Sponsors: J V Boone, J H Troutman.

Wallace G Clarke—Production supervisor, General Aniline & Film Corp, Rensselaer, N Y. Section: (NY) Sponsors: I W Feyler, S M Roberts.

Jack Compton—Technical director, Institute of Textile Technology, Charlottesville, Va. Section: (Pied) Sponsors: S V Stallings, D W Snyder.

Raymond R Currier—Dyer, Collins & Aikman Corp, Ca-Vel, N C. Section: (Pied) Sponsors: E J Grajeck, G R Currier.

Edward S Griswold—Supt of dyeing, Berkshire Fine Spinning Associates, King Philip Finishing Div, Lincoln, R I. Section: (RI) Sponsors: F Tripp, J C Broadmeadow.

Leo R Hubbard—Research assistant, Institute of Textile Technology, Charlottesville, Va. Section: (Pied) Sponsors: S V Stallings, D W Snyder.

Harry S Kalpagian—Textile chemist, Burlington Mills Corp, Greensboro, N C. Section: (Pied) Sponsors: W Stump, B B Swanson.

Charles J Koch—Sales representative, Globe Chemical Co, Cincinnati, O. Section: (MW) Sponsors: H J Kerns, L C Voss.

Lee Kritzer—Sales manager, Morningstar, Nicol, Inc, Charlotte, N C. Section: (Pied) Sponsors: A H Gaede, T R Smith.

Mohamed M Mattini—Laboratory director, United Commercial Industrial Corp, Damascus, Syria.

James N Money—Chemist, technical sales repr, Monsanto Chemical Co, St Louis, Mo. Section: (MW)

Charles L Ogletree—Asst dye foreman, Avondale Mills, Bevelle Plant, Alexander City, Ala. Section: (SE) Sponsors: H G Smith, G L Dozier.

Charles P Richkus—Head dyer, Mooresville Mills, Mooresville, N C. Section: (Pied) Sponsors: A F Baker, W L Johnston.

Harold J E Segrave—Senior chemist, Du Pont Co, Kinston, N C. Section: (Phil) Sponsors: G A Slowinski, J E Smith.

John J Surath—Research and development chemist, Duplan Corp, Charlotte, N C. Section: (Pied) Sponsors: M G Ammann, M H Gurley.

Weingart M Wisnia—Technical manager and partner, Anilinas Y Productos Quimicos, Luna #90, Mexico City, Mexico.

ASSOCIATE

Edward J Dowd—Factory supt, Dellinger, Inc, Rome, Ga. Section: (SE)

Ulisses Ferraz—Chem eng, Cotonificio da Torre, Recife, Brazil.

Walter R Newman—Technical representative, Charlotte Fibre Co, Atlanta 3, Ga.

STUDENT

Carlis Kirkpatrick—Georgia Institute of Technology. Sponsor: W Postman.

Hans Lutjens—Georgia Institute of Technology. Sponsor: W Postman.

Bartley F McNally—Bradford Durfee Technical Institute. Sponsor: C E Medde.

Naman M Sabbagh—Philadelphia Textile Institute. Sponsor: W H Hughes.

Joseph R Wagner—Philadelphia Textile Institute. Sponsor: W H Hughes.

Khali Siavoshi—Lowell Technological Institute. Sponsor: G R Griffin.

APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP

Therese R Commerford
Joseph F Crvarich
Robert W Evans
Solomon P Hersh
Ernest J Khoury
Alan H Lightkep
John R Lindstrom
James E Miller
Alan D Nacht
Robert A. Olney

CORPORATE

The Felters Company
Hart Products Corporation
Industrial Schwarz, SA

Speakers at Special Dyeing Course Given at PTI

PICTURED on the opposite page are the speakers who presented topics as part of a special 8-lecture course on dyeing which was recently completed at the Philadelphia Textile Institute under the auspices of the Philadelphia Section, AATCC.

A—Joseph L R Landry, Philadelphia Textile Institute, "Dyeing Equilibria"

B—Arthur W Etchells, Hellwig Dyeing Corp, "Cellulose Dyeing"

C—Edmund A Leonard, Alexander Smith, Inc, "Absorption of Dyes by Wool"

D—Alfred F Felgendreger, Continental Mills, Inc, "Dyeing of Cellulose Acetate"

E—Joseph F Laucius, E I du Pont de Nemours & Co, Inc, "Colloidal Properties of Dye Solutions"

F—Howard R Walker, Jr, Sandoz Chemical Works, Inc, "The Dyeing of Polyamide Fibers"

G—Richard B Stehle, Brehm and Stehle Corp, "General Survey of Dyeing Processes"

A

B

C

D

E

F

G

AATCC Newsgram

May 9, 1955

NEWS IN GENERAL

A key feature of the AATCC Convention in September will be "Atomic Energy Afternoon," at which a detailed report of the results of the latest atomic bomb explosion will be made by members of the AATCC observers' team (H W Stiegler, Charles Dorn, P J Fynn, and Ernest Kaswell). . . . A number of AATCC test methods are recommended for use in a new clothing "definition and labeling plan" announced recently by six associations in the apparel field. The plan is designed to give more specific meaning to terms used in laundering and cleaning instructions, and was developed by the Inter-Industry Committee on Apparel Cleaning and Serviceability. AATCC test methods are used to measure color permanence, staining, shrinkage and chlorine retention by manufacturers using the new definitions plan. Albert E Johnson, Ralph Smith and Charles Dorn were members of the technical subcommittee which worked out details of the plan. . . . The new corporate membership campaign of AATCC (just getting under way) is already so successful as to offer tremendous encouragement for the coming year; all indications are that the drive will lead to bigger research budgets and expanded activities in a vital field of research.

AT RESEARCH HEADQUARTERS

With Dr Stiegler in Nevada for the atomic explosion, Bob Thompson, administration manager, was on hand at the recent Council and Committee meetings in Atlantic City, representing the Research Labs. . . . Material has been received and work is under way for the following projects: expanded test for colorfastness to alternate light exposure and washing; project to check the effect on color changes caused by detergents with and without optical bleaches; project to compare the degree of staining of multifiber test fabric in the No. 3 wash test versus the 3A wash test. . . . All this work is being done for the Washfastness Committee. . . . Improvements in wear-abrasion testing with the Accelerotor have been made, with promising indications of better reproducibility and more realistic end-use conditions of test. Use of a sponge-rubber collar under the abrasive liner in the Accelerotor chamber has been perfected to the point of indicating better reproducibility, more even abrasion and smoother running. . . . Space is reported selling fast for the 1955 AATCC Technical Wet-Processing Exhibition at the Convention this September, but there are still some desirable locations remaining. All indications point to a highly interesting exhibition "on the boardwalk at Atlantic City."

COMMITTEE NEWS

The Committee on Bleaching has added five new tentative test methods for measuring the efficiency of peroxide bleaching. These will appear in the '55 Technical Manual and Year Book. . . . E W Birdsall has been elected chairman of the Committee on Resistance to Insect Pests, replacing Dr Hans Luttringhaus. . . . Colorfastness to Alternate Light Exposure and Washing (Tentative Test Method 83-54) will be added to the 1955 TM & YB. . . . Charles Sylvester has been named chairman of a new committee to collect, correlate and disseminate information on end use studies on textiles, toward the end of improving AATCC test procedures to make them more in line with end uses. He will name his committee shortly. . . . New officers of the Committee on Stream Pollution, elected April 28 in Atlantic City, are: R Hobart Souther, Chairman; William Stafford, Vice-Chairman; and Duane Snyder, Secretary. . . . ECR will meet May 25 in Boston to discuss the 1955-1956 Research Budget.

Atlanta Convention
"Preparation and Dyeing of Textiles"——

SOME NOTES ON THE TECHNOLOGY OF THE SINGLE-STAGE CONTINUOUS BLEACHING PROCESS*

T E BELL, H D TERHUNE, H L POTTER and M H ROWE

Electrochemical Department
E I du Pont de Nemours & Co, Inc
Wilmington, Delaware

The technology of the single-stage continuous peroxide bleaching process as applied to cotton knit goods, yarn-dyed piece goods, and grey piece goods is discussed. Comparisons of results obtained, based upon the analysis of fabrics obtained from mill-scale runs, are made between single-stage processes and multiple-stage processes. Equipment requirements and operating data for typical single-stage processes are compared with requirements for typical multiple-stage systems. Relative equipment and operating costs are estimated.

INTRODUCTION

IT IS a pleasure to bring to you a report on some recent activities in the field of continuous peroxide bleaching which, in our opinion, may have an important bearing upon the future course of this well-known process. The subject of today's discussion will be, as the title implies, the single-stage continuous bleach process. This process, on which a good deal of effort has been expended in recent months, is intended to simplify the mechanics of the continuous process and to improve its chemistry, so that woven cotton piece goods can be bleached in a single pass through a single J box in a practical and economical manner.

Since the introduction of the continuous peroxide-bleaching process some 15 years ago, great progress has been made. The process has been developed by the co-operative efforts of the textile industry, the manufacturers of textile machinery, and the chemical industry to a point where more than 80%, and perhaps as much as 85%, of the woven cotton piece goods bleached today is processed in one of the several types of systems commercially available.

Although the process was originally devised by chemical manufacturers for the textile industry, many of the early problems were largely mechanical in nature. Consequently, a great deal of the effort which has gone into this development has been concerned with the mechanics rather than with the chemistry of the process, since the basic chemistry was relatively simple and rather easily applied after satisfactory equipment had been designed and built.

As the result of this approach, mechanical improvements have made possible systems which will operate on a continuous basis at speeds approaching 400 yards per minute and will handle all but a few of the basic fabrics produced in large volume by the cotton-textile industry. Although numerous minor changes have been made in chemical formulas, the basic operations have remained the same. They customarily include two, three, or all of the following operations:

Basic Operations of Multistage Processes

1) Desizing
2) Acid souring
3) Caustic scouring
4) Peroxide bleaching

Practically all of the existing continuous bleaching systems, with some exceptions, which will be discussed later, are designed to carry out these basic operations separately and consecutively with different pieces of equipment and different chemical solutions for each operation. This situation has led to the development of systems employing 2, 3 or 4 operating stages, necessitating the use of a large number of J boxes, saturators, washers, and auxiliary mixing, power, and control equipment. Most of these ranges have excellent design and construction, are properly installed, and give highly satisfactory performance. They do have some limitations, however, and are unsuitable for certain fabrics, such as knit goods.

The equipment for these multistage systems is expensive to purchase and expensive to maintain. Each range requires several operators, and subjects the fabric to several chemical treatments as well as much mechanical handling. For some fabrics, such as knit goods and fragile woven fabrics, these treatments are excessive and can lead to mechanically or chemically damaged goods. As these disadvantages were recognized, efforts were made in the early days of the development to utilize a single J box for all of the treatments. These early attempts at single-stage processing were not successful, partly because the equipment had not been perfected and partly because the chemistry of the process had not been thoroughly explored.

NEW APPROACH TO BLEACHING

Several years after the successful introduction of the multistage process for woven goods, a new attempt was made to develop a single-stage process for cotton knit goods. This time the attempt was successful, and a number of single-stage ranges for knit goods have been operated for six or more years commercially. The fabrics produced are in every respect equal to those produced in other processes, and many millions of yards of knit goods bleached in the single-stage system have been marketed.

Basically, there is no difference between the cotton used in knit goods and the cotton used in woven cloth. There are important differences in the yarn and fabric construction, however, which affect the bleachability of the fabric.

Woven cloth contains sizing materials, which are not used in knitted fabric, and which are normally removed before bleaching to facilitate the process. That complete desizing is not essential we have determined by processing woven piece goods in the same equipment and with the same formulas as have been determined to be satisfactory for cotton knit goods. Analyses of the bleached fabric by standard tests give the results illustrated in Table I.

* Presented before the Symposium on Preparation and Dyeing of Textiles in the Ballroom of the Atlanta Biltmore Hotel in Atlanta, Ga, on Sept 15, 1954, with Walter M Scott presiding.

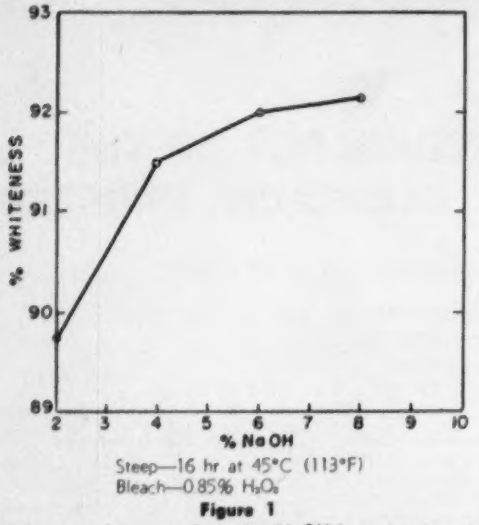


Figure 1
Effect on whiteness of varying NaOH in pretreatment

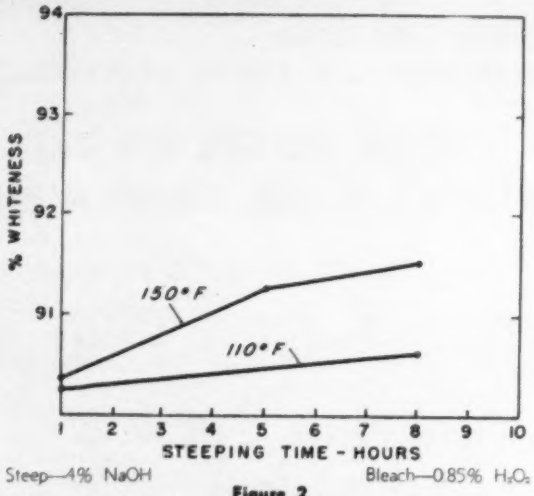


Figure 2
Effect on whiteness of varying time and temperature in caustic soda steep

It is obvious from the data in Table I that the standard knit-goods process is not satisfactory for processing woven goods without considerable modification. As will be noted from these analyses, the bleaching action is somewhat reduced in the case of the woven fabric, and the cloth is not quite so white nor so well purified. Although it does not show in the analysis, mote removal is not complete in the woven fabric but is complete in the knitted cloth.

TABLE I

COMPARATIVE BLEACHABILITY OF WOVEN AND KNIT GOODS

Analysis	*Knit Cloth*	*Woven Cloth*
% Whiteness	87.2	81.0
Absorbency (Secs)	0.1	1.8
% Oils, fats & waxes	0.13	0.28
% Noncotton	0.81	1.4
% Ash	0.65	0.53
Fluidity (Rhes)	3.02	4.4

CAUSTIC STEEP——— In the course of this development work it has been found that a pretreatment with caustic soda is effective in preparing the fabric for bleaching. The pretreatment referred to differs from the normal caustic scouring, since storage at high temperature in a J box is not required. The customary enzyme desizing operation may also be eliminated. From the economic viewpoint, both points are important in developing an efficient and low-cost process.

In practice, the cloth is saturated with a solution of caustic soda in the quench box of the singer and is then stored in a bin to permit the reaction between the caustic and cloth impurities to take place. Figure 1 illustrates the effect of the caustic concentration upon the final whiteness. Whiteness values were determined with a Hunter Multipurpose Reflectometer with a blue filter in the light source. They are expressed as % whiteness compared with a magnesium oxide block.

The data in Figure 1 shows that there is a diminishing return in terms of final whiteness per unit of caustic used when the caustic concentration exceeds 4%.

The effectiveness of the caustic steep also is increased by raising the application temperature. Approximately 1 additional whiteness point can be obtained by increasing the temperature from 110°F to 150°F when maintaining a storage time of 4 hours. At the higher temperature, the same whiteness can be obtained in about one-fourth the time required at the lower temperature.

Figure 2 illustrates the effect, on the ultimate whiteness, of varying the time and temperature of the caustic steep. It should be noted that all the whiteness readings are in the upper range, ie, above 90%, indicating thorough preparation for bleaching by the caustic-steep method.

In normal plant operations it has been found satisfactory to saturate the fabric with 4% caustic soda solution at 120-140°F and to store it in bins for 4-16 hours. The actual time required for optimum results varies with the fabric being processed. Heavy fabrics, such as Type 140 sheeting, or goods containing large amounts of motes and shives, such as crash towelings, require the longer storage period, while lighter fabrics, such as 4- to 6-yard print cloths, can be successfully bleached after a 4-hour storage period.

Experimental tests, in which a 4% caustic steep was applied for 16 hours at 110°F, resulted in a whiteness of 90% or higher and still produced fabric in the normal fluidity range. An 8% caustic steep for 8 hours before bleaching also produced fabric without abnormal degradation.

PEROXIDE BLEACHING———Up to this point we have been considering only the pretreatment of the cloth and have not considered the actual peroxide-bleaching step. It has been found that the direct substitution of the caustic steep previously described for a standard caustic J-box scour, followed by the normal peroxide bleaching formula, will not give satisfactory results. It is necessary to adjust the bleaching formula to compensate for the difference between the two methods of preparation. For one thing, too high an alkalinity in the bleach formula adversely affects the final whiteness.

Figure 3 illustrates the effect of increasing the amount of free caustic soda in a bleach formula containing sodium silicate and hydrogen peroxide. Approximately 1.5% sodium silicate and 0.85% hydrogen peroxide, both owf (on wt of dry fiber), was required to obtain the whiteness values indicated.

As might be expected, the quantity of hydrogen peroxide required to produce a whiteness meeting commercial standards is higher than that normally used in the multistage systems, and, as might also be expected, the peroxide requirement varies with the fabric being processed. Experimentally, whiteness values of 90% or more have been obtained with 0.5% H_2O_2. In several mill trials 0.8% H_2O_2 was used to produce a fabric whiteness of 86%.

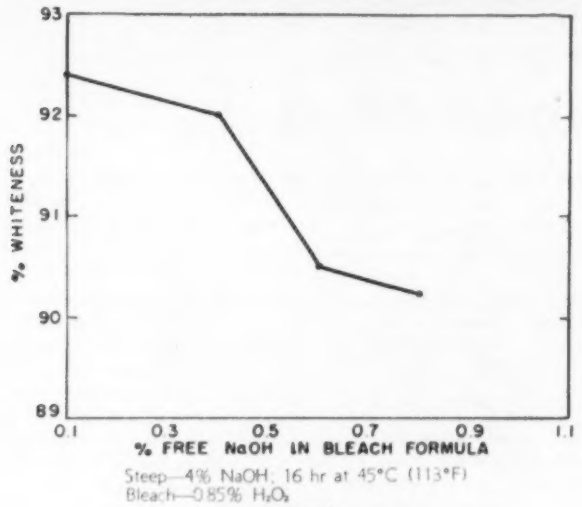


Figure 3
Effect of varying NaOH in bleach formula

An analysis of an 80 x 80 print cloth bleached in a mill trial after a caustic steep is shown in Table II. For comparative purposes, the average values obtained from 23 mills using multistage processes are also shown.

In order to obtain some data on the effect of acid souring, a high-spot evaluation has been made of acid-soured cloth both with and without a subsequent caustic steep. In general, the results were equivalent to those obtained in the average multistage process, consisting of desizing, caustic-scouring, and peroxide-bleaching steps. In this experiment the cloth was not desized before the caustic steep. Table III illustrates the values obtained by the analysis of a Type 128 sheeting, treated with the caustic-steep acid-sour method, as compared with the average values for fabrics bleached in multistage processes.

Only one trial was involved in this test, and the acid sour used was 1% sulfuric at room temperature, with a storage period of 20 minutes. Another test, made with 80 x 80 print cloth, was made with omission of the caustic steep. In this test the fabric was washed in hot water, soured in 1% sulfuric acid at 120°F, neutralized with caustic soda, and peroxide-bleached. Good bleaching and cloth preparation were obtained. Table IV shows the data obtained from this test, again compared with the normal two-stage bleaching system used at the mill.

During the course of these tests, a number of observations were made which do not show up in the analytical data but which nevertheless are significant to the processor. For one thing, the cloth weight losses in these single-stage processes are considerably lower than the normal losses in multistage processes. Also, the shrinkage in width is reduced, and this is important from a finishing standpoint. A considerably fuller hand can be obtained with a minimum of finishing.

Although in all cases where the hot caustic J box treatment was omitted the noncotton content was higher than normally obtained in multistage processes, the reduction from the grey was still sufficient to give adequate cloth preparation for finishing.

TABLE II

COMPARISON OF RESULTS OBTAINED IN 1-STAGE AND 2-STAGE BLEACHING SYSTEMS

Analysis	*NaOH Steep 1-Stage Bleach*	*2-Stage Bleach*
% Whiteness	86.0	86.5
Absorbency (Seconds)	1.9	2.5
% Oils, Fats, & Waxes	0.33	0.26
% Noncotton	1.00	0.65
% Ash	0.20	0.22
Fluidity (Rhes)	4.6	4.9

TABLE III

EFFECT OF ACID SOUR

Analysis	*1-Stage Bleach Acid Sour*	*2-Stage Bleach*
% Whiteness	86.0	86.5
Absorbency (Seconds)	0.26	2.5
% Oils, Fats, & Waxes	0.51	0.26
% Noncotton	0.80	0.65

TABLE IV

EFFECT OF ELIMINATING CAUSTIC SOUR

Analysis	*1-Stage (No NaOH Scour) Acid Sour*	*2-Stage (With NaOH Scour)*
% Whiteness	89.0	88.0
Absorbency (Seconds)	1.25	1.5
% Oils, Fats, & Waxes	0.22	0.20
% Noncotton	1.08	0.38
% Ash	0.46	0.05

ADVANTAGES OF SINGLE-STAGE SYSTEM

The commercial application of these new processing methods depends upon the requirements of the individual mill, the types of fabric handled, and the equipment available. The caustic-steep method is of special interest to mills which now have single-stage systems but are faced with the necessity of increasing production. This can be done without increasing capital investment and without increasing over-all processing costs; in some cases, reductions up to 20% in processing costs are indicated.

In mills which now have multistage systems, production can be increased without a major increase in capital investment by splitting the system into two or more single-stage systems. This increased production can then be obtained at lower operating speeds and at lower power and maintenance costs.

For mills where equipment is worn out or obsolete, new single-stage systems can be installed for about 40% less than a new two-stage system or for about 60% less than a three-stage system.

In addition to savings in capital investment and operating costs, single-stage systems permit the fabric to be processed with a minimum of mechanical handling and with appreciably less mechanical damage and rub or bruise marks, which may show up only in subsequent processing.

Our data indicate that, with some modifications, which we are currently investigating, single-stage systems can replace multistage processes with important advantages to the mill. These processes will ultimately be as simple as the present single-stage system now commercially operating on cotton knit-goods, and to a limited extent, on woven cotton fabrics.

Before concluding, we would like to express our appreciation to those mills that have graciously permitted us to use their facilities to demonstrate these new methods. Without their help, this information could not have been collected, and this paper would not have been possible.

(Concluded on page P327)

Atlanta Convention "Preparation and Dyeing of Textiles"——

SPUN-COLORED FIBERS*

GEOFFREY V LUND

Courtaulds (Alabama), Inc
Mobile, Ala

The historical development, production, and properties are discussed of fibers colored before chemical spinning by incorporation of coloring matter into the fluid material from which fibers are spun.

The advantages, limitations, and techniques of use of these fibers are described, and an estimate of their future place in textile economy is attempted.

INTRODUCTION

IF the manufacture of textile fabrics is not the earliest craft learned and practiced by our primitive ancestors, it is one of the very earliest. Threads were already spun and woven into fabrics when our European ancestors lived in lake dwellings, and remains of implements, and of fabrics, have been found on the sites of such dwellings — without, however, any evidence to suggest that the fabrics were colored.

On the other hand, fabrics found in the tombs of Egypt show that the art of dyeing was relatively advanced even at that early time, and the dyeing of red with madder and of blue with indigo are processes which seem to have been familiar to the people of India, China, Persia and Egypt several thousand years before the Christian era.

This evidence emphasizes the antiquity of the textile and coloring arts, emphasizes the enormous length of time occupied in the slow evolution of these craft industries, and also emphasizes the rapidity which development has followed development since the Industrial Revolution of the nineteenth century.

This long process of development took place with natural fibers, such as flax, wool and cotton, and with naturally occurring dyestuffs, such as madder and cochineal, until the work of Runge, Lightfoot, Perkin, Griess, and others initiated the use of coal-tar dyestuffs in the middle and latter half of the nineteenth century.

At the turn of the century the man-made-fiber industry was born, and with the beginning of the production of fibers by man came the idea that fibers could be colored during manufacture.

HISTORICAL DEVELOPMENT——

It seems to have been obvious that coloring of the liquid substance could be done before spinning the fiber, and, in fact, according to H F Edwards*(1)*, it was suggested in 1841 that colored silk might be obtained by feeding dyestuffs to silkworms.

In 1897, Draper and Tompkins*(2)* in a patent described how solutions of cellulose in zinc chloride were colored by the incorporation of a dye or lake, and in 1907 Werner*(3)* described the addition of dyes and mordants to solutions of cellulose in zinc nitrate; also, Fielding*(4)* described a method of preparing viscose solutions from dyed fabrics, the solutions being used to obtain a permanently colored stiffened finish.

A patent by Lederer*(5)* in 1903 is the earliest reference to the coloring of acetate before spinning. He described the addition of dye liquors, solid coloring matters, and metal dusts to solutions of cellulose acetate.

Sufficient has been said here to show that the idea is not new, but the commercial development of the principle was delayed for some time. In fact, so far as viscose rayon is concerned, the next major advance did not take place until a British Patent*(6)* appeared in 1921, in which Wilson and Courtaulds described the addition of the leuco form of vat dyes to viscose solutions. A little consideration, however, would suggest that the stringent requirements of the viscose process, limiting the choice to a very few stable coloring matters, were the main cause of the delay. This also explains the choice of vat dyestuffs in leuco form, an idea which was further pursued by Meister, Lucius and Bruning*(7)*. However, it was found that vat dyes in solution in viscose upset spinning conditions, and some years passed before Robertson and Courtaulds*(8)*, in 1934, suggested the addition of auxiliary solvents to the viscose solution to overcome this difficulty.

At about this period it was appreciated that, since the viscose process makes severe demands on the stability of any coloring matter incorporated before spinning, and viscose rayon staple is relatively cheap and easy to color with direct dyes, there would be little point in pursuing developments on colors other than those of very good stability and inherent fastness. Two lines of attack appear to have been pursued at about this time: the first based on the idea of dyeing the fiber and the second on the idea of coloration by pigment, that is, by the incorporation of color not necessarily having any substantivity for the fiber.

Dosne*(9)* patented the addition of sulfuric esters of leuco vats to cuprammonium and viscose solutions before spinning, his process submitting the spun fiber to an acid oxidation treatment to develop the color. At about the same time, I G Farben*(10)* covered the addition of vat dyes in the form of pigments in a state of fine subdivision to viscose, subsequently developing by alkaline reduction followed by oxidation.

The addition of pigments was also covered in a process*(11)* in which a small particle size was obtained by precipitation of the vat dye from its leuco compound, and from the sulfuric esters of the leuco compounds by the addition of amines to form insoluble ammonium or phosphonium lakes.

However, the relative ease of reduction of vat colors during the manufacture of the fiber raised very many difficulties, and, accordingly, other types of coloring matter were sought. In 1929 H J Hegan and Courtaulds Limited*(12)* described a method of coloring viscose by forming an emulsion with an oil colored by an oil-soluble, water-insoluble dye, and in 1935 Glazener*(13)* described the addition of naphthols to viscose and coupling with a diazo compound after spinning.

Parallel with this search for adequate coloring matters, a search was also going on for the most convenient means of adding such a material to the viscose solution. It was obvious at quite an early stage that the coloration of large batches of viscose would make factory organization very difficult and would impose very severe limitations on the number of colors that could be produced. Aggregation and flocculation of pigments are further difficulties which were experienced at an

* Presented before the Symposium on the "Preparation and Dyeing of Textiles" in the Ballroom of the Atlanta Biltmore Hotel in Atlanta, Ga, on Wednesday afternoon, Sept 15, 1954, with Walter M Scott presiding.

early stage. Consequently, Stokes and Courtaulds(14) patented a method of injecting dyes or dispersed pigments into the viscose supply to the spinning machine, so that several units could produce different colors simultaneously from the same supply of viscose.

All this work established the main line of development as being the injection of dispersions of relatively inert pigments into the viscose before the spinning machine, and the use of dyeing reactions involving aftertreatments has been abandoned to all intents and purposes.

Since then, a considerable amount of work has been carried out, both by dyestuff manufacturers and fiber producers, and this co-operative effort has resulted in the availability of a considerable number of good colors.

MANUFACTURE AND PROPERTIES

THE SELECTION OF A RANGE OF COLORS——In selecting a range of colors of spun-dyed rayon staple the manufacturer must bear many considerations in mind. He must first of all ensure that all the colors are of adequate fastness, and for this, of course, fiber manufacturers are greatly indebted to the pioneers of the AATCC and the ASTM here and the Society of Dyers and Colourists in the United Kingdom, who introduced well-accepted testing methods and standards of fastness without which the introduction of any new method of coloring would be very difficult indeed.

His next consideration, so far as rayon staple is concerned, is to choose a range of colors of adequate fastness, which do not give trouble in chemical spinning, which are attractive and saleable in themselves, but which are also useable in combination with each other, so that from a relatively small range, yarn spinners and weavers may produce a very much wider range of effects, both substantially solid and deliberate "heather" effects.

Warburton and Lund(15) have given an account of the difficulties involved, and work carried out by Friele and by Guthrie and Oliver, reported by Butterworth and Cluley(16), on the ICI system of color specification has shown how the blending possibilities of a range of colors may be calculated, the gaps in a range of colors suggested, and the colors ideally desirable to fill in those gaps also suggested. It is not often possible to fill in the gaps with the colors ideally desirable, because it is not often that a pigment of the ideally desirable color and requisite fastness is available, but this kind of information is of great use in building up a range of colors of good fastness which will be of the greatest possible use to designers and stylists, and yet will not be so unwieldy as to make it difficult for the fiber manufacturer to give good service.

FASTNESS OF THE "COLORAY"(R) RANGE OF COLORS——

a) *In use.* As an indication of the type of fastness obtained by this method of coloring, it is worth while to discuss the degree of fastness achieved in the "Coloray" range of colors. According to tests carried out by the South Florida Test Service, many of the colors are Class 8 and none are lower than Class 6 in fastness to light when exposed under glass. None of the colors are lower than Class 6 when exposed to direct weathering. All the colors are fully fast to AATCC Wash Test #3, and only one color is lower than Class 5 on Wash Test #4.

The US Testing Company reports that tests according to the tentative procedure of the AATCC for fastness to acid and alkaline perspiration revealed negligible staining with all colors, and all the colors are fast to sea water and bathing-pool water.

b) *In processing.* The preceding information refers to behavior in use, but of equal importance is behavior between loom and finished fabric. Although we have a great deal of information on the behavior of our range of colors during finishing, we cannot pretend to have all the information relevant to the way in which fabrics may be treated in an industry as diverse as the American textile finishing industry, but we do nevertheless have a great deal of information.

i) *With wool.* Although the use of spun-colored fibers with wool is not yet fully developed in this country, we have considerable experience with the behavior of our "Coloray" range in wool-type finishing plants in England.

Provided wool dyes and methods are used that would not stain cellulose, either cotton or viscose rayon, then the wool can be dyed to any desired shade and the "Coloray" color will be unchanged. The dyeing process, with level dyeing acid dyes, metallized azo dyes or chrome dyes, will not affect the colors, except that our brown is not quite fast to chrome dyeing. All the colors are fast to normal scouring and milling, except that the red, like an azoic red, will lose a little color when soap liquor is worked into it in milling.

All the colors are fast to the wet-chlorination processes used in England, and we would expect no trouble in the USA; similarly, peroxide bleaching, as normally practiced for wool, has no harmful effect on any of the "Coloray" colors.

ii) *With rayon.* No difficulties should arise in processing as or with filament or spun-viscose rayon, that is, in desizing and hypochlorite or peroxide bleaching. It is important to realize, however, that spun-colored viscose has as much affinity for cotton dyes as has white viscose, but with mixtures of spun-colored black and white, overdyeing to produce a range of mixture effects is a technique which is finding increasing favor. If overdyeing or overprinting is done with vat dyes, however, then there may be destruction of the coloring matter. All the "Coloray" range with the exception of the yellows, blues and greens, withstand reduction with hydrosulfite and caustic soda.

Crease-resistant finishing has little effect on the fastness of the "Coloray" range, and "Avcoset"-formaldehyde antishrink, "Zelan" and crease resist, melamine-formaldehyde, X2, and "Sanforset" have no adverse effect on color and light fastness.

iii) *With cotton.* When spun-colored viscose fibers are processed with cotton, the conditions are much more severe. It appears that caustic soda kier boils should be avoided, and that milder alkaline pretreatments are desirable. A hydrogen peroxide bleach, such as would be used in jig or kier work, has little effect on the colors, and peroxide steam-bleaching experiments have caused little color change and no bleeding except on the red and brown.

The comments made earlier about the dyeing of viscose rayon in the presence of "Coloray" of course apply with equal force when a blend of cotton and "Coloray" is dyed.

iv) *With synthetic fibers.* Since the art and science of dyeing many of the newer synthetic fibers are still in their infancies, leaving many problems unsolved, it is impossible to give complete data on the fastness of the "Coloray" range to all the influences to which they might be subjected when used in blend with the newer synthetics. However, it has been established that all the colors are fast to cross dyeing by the carrier technique when sodium orthophenylphenate is used as the swelling agent.

The cuprous-ion method of dyeing with hydroxylamine sulfate for reduction is suitable for fabrics containing "Coloray," except for khaki and tan; a slight change of color occurs with Indian yellow.

High-temperature dyeing (at 115-130°C, or 239-266°F) may cause some marking off of color from some shades

of "Coloray" onto nylon, "Dacron" or acrylics, especially from a soap or acid bath, but less so if salt is present.

THE FUTURE PLACE OF SPUN-COLORED FIBERS

It is possible to make an assessment of the probable size and direction of development of the use of color-spun staple in this country by considering the advantages and disadvantages of the system.

ADVANTAGES———Taking the advantages first of all, the system affords very good all-round fastness at surcharges for color ranging, for example, from 3 cents for black to 22 cents for red. It is possible to give very much closer matching by this system than by any other system of dyeing, and, of course, as with raw-stock dyeing, it gives complete freedom from streaks and shading. In solid colors it makes possible fabrics which look very much more solid and of higher quality than is obtainable by piece dyeing.

DISADVANTAGES———On the debit side of the ledger is decreased manufacturing flexibility from dyeing very much earlier in the scheme of operations, a disadvantage which may largely be overcome by designing a range of styles and colors in which a common warp is used and only the filling is altered.

It is also desirable, in order to avoid contamination of white fibers by colored, to process spun-colored fibers through a section of a mill processing goods which will finally be dyed. If this is done, the risks involved are considerably less than those involved in the processing of stock-dyed materials, and are no greater than those involved in the processing of any series of fibers of differing dyeing properties.

To hold the inventory problem of the spinning mill to a minimum and to enable the fiber manufacturer to give good service, it is necessary to produce a relatively limited number of colors. However, when the range is chosen properly, this is not an unmixed disadvantage, since it enables the stylist and manufacturer to build up distinctive lines of colors from blends which do at least give him the competitive lead that his effort deserves.

LINES OF DEVELOPMENT——— Firstly, as would be expected, because of the excellent fastness and far superior processing properties of spun-colored fibers in comparison with raw-stock-dyed fibers, and their much lower waste factors, spun-colored viscose fibers are making very good progress in those end uses which call for stock-dyed rayon. The only disadvantage of the system is the impossibility of spinning very small weights of special colors, and this disadvantage is in very many cases easily overcome by the blending of colored fibers in the spinning mill, a technique which is making considerable progress.

Secondly, spun-colored fibers are making, and may be expected to continue to make, good progress in those end uses where very good color fastness is desirable. An example of this type is the use of black "Coloray" in automobile tops.

Thirdly, spun-colored fibers will without doubt make progress in the woolen and worsted industries, where the problems of running blends of colored fibers are already well understood.

Much progress has been made with spun-colored fibers in that branch of the industry which normally uses yarn-dyed material for the manufacture of checks, plaids and ginghams, and, according to an investigation carried out about a year ago, for this type of goods the use of "Coloray" shows, in many cases, a saving over the cost of direct colors as well as a very substantial saving when compared with vat colors, in whose fastness category the "Coloray" colors belong. We may therefore expect expansion in this direction.

In the apparel trades, considerable use is being made of the novelty effect of blending colored fibers, and, although this type of development is subject to the vagaries of fashion, it is considered likely that this line of development will grow, since, following general acceptance of the idea, one may rely on the ingenuity of the stylist to cope with fashion changes.

Another line of development is the type of fabric which must have a high degree of fastness, usually in solid colors, and which is made in a relatively limited number of colors each season. Rayon flannels and gabardines are two examples of this type of fabric. Here the loss of flexibility in plant operation consequent from the use of spun-colored fibers is of little importance because of the long runs involved, and the high degree of fabric quality and color solidity swings the balance in favor of the use of spun-colored fibers.

SPUN-COLORED FIBERS AND THE DYEING INDUSTRY———All the developments mentioned above are the ones where the obvious immediate advantages of spun-colored fibers are of use. However, the power of American advertising is very great, and it is said that one cannot sell a new cloth without advertising. Obviously, the manufacturers of spun-colored fibers are going to place the advantages of their products before the industry and before the consumer public, and, since a high degree of fastness is one of the properties to be promoted and exploited, the use of spun-colored fibers is likely to raise the fastness requirements of many fabrics, rayon shirtings being one example. This would surely be a very welcome development from many points of view.

No fiber manufacturer would suggest that the use of spun-colored viscose will eliminate other methods of dyeing, but the use of spun-colored fibers is likely to increase quite rapidly, its first effects being felt in the raw-stock-dyeing industry, followed by yarn dyeing and then by piece dyeing, and this increase is likely to bring with it a demand for closer standards of color matching and higher standards of fastness, because goods of excellent fastness will be advertised, the advertised claims being followed up by good performance.

REFERENCES

(1) H F Edwards, *Silk*, No. 8, 41 (1921); *J Textile Inst* 12, 402 (1921).
(2) W T Draper and H K Tompkins, *BP* 17,901 (1897).
(3) W A P Werner, *BP* 1850 (1901).
(4) A Fielding, *BP* 20,396 (1901).
(5) L Lederer, *BP* 7,341 (1903).
(6) I T Wilson and Courtaulds Ltd, *BP* 181,902 (1921).
(7) Meister, Lucius and Bruning, *German Pat* 360,001 (1921).
(8) S Robertson and Courtaulds Ltd, *BP* 427,134 (1934).
(9) H Dosne, *BP* 403,409 (1933).
(10) I G, *BP* 448,447 (1934).
(11) I G, *German Pat* 622,807 (1934).
(12) H J Hegan and Courtaulds Ltd, *BP* 342,696 (1929).
(13) Glazener, *French Pat* 785,752 (1935).
(14) W H Stokes and Courtaulds Ltd, *BP* 290,693 (1927).
(15) P Warburton and G V Lund (in preparation).
(16) E Butterworth and A S Cluley, *J Textile Inst*, 39th Annual Conference Issue (1954).

DISCUSSION

Question: Why should four different samples of a certain type of fabric produced with spun-colored fibers differ in properties when the only difference in manufacture is that of color?

Answer: We have not yet experienced important differences in final properties from the use of different pigments and different amounts of pigment. We think these pigments do not catalyze decomposition of the fiber, and we also think such fabrics should be close in tensile strength. And these have not been found to differ much also from fabrics produced from bright and dull fibers; you know dull fibers, after all, contain white pigment.

Q: Does pigment increase the tendency of a fabric to unbraid or to show a piping effect?

A: We have not heard of such an effect. The pigment, because it goes into the viscose mass, is mostly within the fiber, and very little is in or on the surface.

Atlanta Convention
"Dyeing of Textiles"——

ACRILAN DYEING*

WALTER H HINDLE

Chemstrand Corporation
Decatur, Alabama

The dyeing of textiles containing all-Acrilan acrylic fiber, the dyeing of Acrilan-rayon, Acrilan-acetate, and Acrilan-rayon-acetate materials, and the dyeing of blends of Acrilan with wool and nylon are discussed by the author. The following dyestuff classes are employed in a variety of ways to get a variety of colored effects: directs, disperse (acetate) dyes, chrome dyes, vat dyes, leuco esters, level-dyeing and neutral-dyeing simple acid dyes, and neutral-dyeing metalized acid dyes.

INTRODUCTION

ACRILAN acrylic fiber, as manufactured by The Chemstrand Corporation at Decatur, Alabama, is unique in the new-fiber-dyeing field in that it can be dyed with most of the regularly used types of dyestuff, including direct, basic, disperse (acetate), all classes of acid, vat and sulfur dyes, by methods not substantially different from those used on the fibers for which these dyestuffs were initially developed. Because of the time limitation attached to this paper, my remarks will be chiefly concerned with the application of basic, disperse (acetate-type), various acid-type, and vat dyes on 100% Acrilan, on Acrilan-rayon and Acrilan-acetate textiles, and on blends of Acrilan with wool and nylon.

100% ACRILAN

The dyestuffs designed for cellulose acetate will dye 100% Acrilan acrylic fiber in a full and complete shade range from pastel to black without need for recourse to carrier systems of dyeing, when the dyeing is conducted above 200°F. The rate of dyeing is gradual, and dyeing times range from 45 minutes for pastels to 150 minutes for blacks. Conventional dyeing assistants are held to a minimum, the best of which appear to be the nonionics, like Triton X-100. A feature of the disperse dyestuffs as applied to Acrilan is the outstanding wetfastness to be obtained over a full color range. Dyeings based on a post-dyeing scour at 140-160°F, which, incidentally, does not effect the shade, possess excellent crock, perspiration, and washfastness under 140°F conditions of test. An aftertreatment with 3% of copper sulfate and 2% acetic acid owf at 160°F for 20 minutes will increase the washfastness to a point where the dyeings will withstand 5 consecutive AATCC #3 cotton wash tests without loss of color and with only minimum staining of the nylon and acetate components of the accompanying test cloth. Insofar as lightfastness is concerned, by utilizing some of the dyestuffs developed for pastel shades on Dacron, a Fade-Ometer fastness of 20-80 hours can be obtained for a full range of colors. As an auxiliary to the lightfastness of disperse (acetate) dyestuffs, many neutral-dyeing wool dyestuffs can be incorporated into disperse (acetate) formulas containing ammonium acetate or ammonium sulfate, which will yield 40-80 hours' Fade-Ometer fastness and the washfastness previously described. Although pressure-dyeing systems demonstrate possibly a 20% advantage insofar as dyestuff utilization is concerned and a faster dyeing cycle, they have no outstanding value for penetration purposes in that cross-sectional examination shows that disperse (acetate) dyestuffs effect complete penetration within the fiber under normal conditions of dyeing. The advantages of disperse dyestuffs are well known, particularly in view of the fact that carriers are not necessary. Their penetrative, leveling and general manipulative qualities insofar as the dyer is concerned offer the optimum in the way of application ease. The problem of atmospheric fading associated with the disperse dyes on cellulose acetate does not exist on Acrilan, and sublimation can be brought under complete control by selection of the proper dyes. (See Example I).

Basic dyestuffs selected especially for their use on acrylic fibers show excellent properties on Acrilan acrylic fiber. In light to medium depths, the color utilization of basics is excellent. Even pastel shades are showing 20 hours Fade-Ometer fastness, and basic dyeings are fast to the AATCC #3 Wash Test. In the presence of nonionic dispersing agents, disperse (acetate) and basic dyestuffs possess compatibility, with the result that shades of outstanding brilliance in conjunction with optimum colorfastness can be obtained. The method of application is extremely simple and involves the use of minimum amounts of nonionic dispersers or surfactants and temperatures of 205°F. Excellent color value is obtained in light to medium shades. pH of the dyebath is of great importance and ammonium acetate provides an excellent means of yielding the optimum pH of 5.5-5.7. For heavy shades other types of dyestuffs can be used to better advantage, particularly from an economic standpoint. (See Example II).

One-hundred-percent Acrilan may also be dyed in a full and complete shade range with various classes of so-called acid dyestuffs by methods closely similar to the application of the same dyestuffs on wool. It is of cardinal importance that, for any type of acid dyestuff, sulfuric acid to the extent of 3-6% be applied for mini-

Example I
Disperse (Acetate) Dyestuffs on 100% Acrilan in Dk Blue

	% owf
1) Set bath	
Sandopan TLF	0.25
2) Add dyestuff	
Amacel Violet	
Blue FSI	2.5
Celanthrene Pure	
Blue BRS	1.25
	150 min @ 208°F
3) Rinse & light scour	
Igepon T	0.5
TSPP	0.5
	20 min @ 140°F

Example II
Basic Dyes on 100% Acrilan in Periwinkle Blue

	% owf
1) Set bath with	
Peregal TW	1.0
ammonium acetate	1.0
	10 min @ 120°F
2) Add dyestuff	
Sevron Blue B	1.10
Sevron Red L	0.06
	110 min @ boil
3) Rinse & light scour	
Igepon T gel	0.5
	15 min @ 140°F

* Presented before the Symposium on Dyeing of Textiles in the Empire Room of the Atlanta Biltmore Hotel in Atlanta, Ga. Sept 16, 1954, with Kenneth S Campbell presiding.

mum periods of one hour in order to obtain full penetration of the dye into the fiber. For example, a number of chrome dyestuffs will exhaust readily onto Acrilan after, say a 90-minute dyeing period, with either acetic or formic acid. At this point, 3-6% of sulfuric acid in accordance with the depth of the shade is added to the dyebath, and the color is exhausted for an additional 45 minutes. Chroming takes place in conventional fashion. In this way chrome dyestuffs will give complete fiber penetration. A number of structurally simple chrome dyes can be used to great advantage on 100% Acrilan to produce very inexpensively the colorfastness normally obtained on wool. The use of chrome dyestuffs provides a straightforward means of obtaining shades ranging from medium to black with a lightfastness of 40-100 Fade-Ometer hours and washfastness at 185°F. Not the least of the advantages of the chrome dyestuffs is their extreme cheapness in relation to conventionality of dyeing method. The structurally simple chrome dyestuffs, such as *Colour Index* 180, CI 219, Pr 93, Pr 514, and Pr 14, present no problem insofar as development of shade is concerned in the afterchroming process, and, in the main, it can be said that chrome to the extent of 1/3 to ½ the weight of dyestuff in the presence of sulfuric acid produces effective chromation. (See Example III).

The total range of metalized dyestuffs can be applied to Acrilan with 4-8% of sulfuric acid to provide lightfastness similar to that obtained on wool and washfastness generally superior. Frequently for the purpose of obtaining brighter shades, acid-type dyestuffs can be applied with the metalized types to round out a very comprehensive color range. Level-dyeing acid dyestuffs demonstrate their fullest value in the medium-shade range where all-around good fastness is obtainable. However, in light shades, poor lightfastness is found for the most part, and in the dark shades alkaline perspiration presents difficulties. The acid colors find their chief value in obtaining high mode shades, and particularly is this noticeable in the brilliant red area where acid dyestuffs show a very radical economic advantage over basic dyestuffs while maintaining brilliance of shade without sublimation difficulties. (See Examples IV and V).

The neutral-dyeing types of acid dyestuffs, including the premetalized, can be applied to Acrilan in light to medium shades to produce good all-around fastness, but up to this point complete penetration of the dyestuff into the fiber has proven to be difficult of attainment without impairment of the lightfastness. Two to 3% of sulfuric acid owf after the dyebath has been exhausted provides complete penetration but at the expense of lightfastness. The neutral-dyeing types of acid dyestuff find their chief value in light and light-medium shades, and particularly in combinations with disperse dyestuffs where the penetrative properties of the latter adequately compensate for the weaknesses of the neutral-dyeing types insofar as penetration is concerned. Of particular value in this respect are the neutral-dyeing types capable of chromation, such as Neutral Grey L and Neutral Brown BGL, where tertiary combinations are involved.

Example III
Chrome Black on 100% Acrilan

	% owf
1) Set bath	
Palatine Salt O	2.00
formic acid	3.00
	10 min @ 160°F
2) Add dyestuff	
Eriochrome Black T 156%	7.00
Omega Chrome Black 2G	2.00
	30 min @ 210°F
3) Add sulfuric acid	4.00
	20 min @ 210°F
4) Additional sulfuric acid	4.00
	120 min @ 210°F
5) Rinse well and afterchrome in new bath	
sodium bichromate	3.00
sulfuric acid	3.00
	90 min @ 210°F
6) Rinse and scour	
Igepon T gel	0.5
TSPP	0.5
	25 min @ 140°F

Example IV
Metallized Navy on 100% Acrilan

	% owf
1) Set bath with	
Palatine Salt O	3.00
sulfuric acid	2.00
	10 min @ 160°F
2) Add dyestuff	
Neolan Blue 2G Conc	2.30
Neolan Pink BA	0.50
Neolan Orange R	0.50
	30 min @ 210°F
3) Add sulfuric acid	3.00
	30 min @ 210°F
4) Additional sulfuric acid	3.00
	120 min @ 210°F
5) Rinse & neutralize in bicarbonate of soda	8.00
	20 min @ 90°F
6) Light scour	
Igepon T gel	0.5
	20 min @ 140°F

Example V
Brilliant Red on 100% Acrilan

	% owf
1) Set bath	
Palatine Salt O	2.0
formic acid	2.0
	10 min @ 160°F
2) Add dyestuff	
Fast Scarlet BA	2.0
	30 min @ 210°F
3) Add sulfuric acid	3.0
	30 min @ 210°F
4) Additional sulfuric acid	3.0
	120 min @ boil
5) Rinse & neutralize bicarbonate soda	8.00
	15 min @ 90°F
6) Light scour	
Igepon T gel	0.5
	20 min @ 140°F

Indigoid and thioindigoid vat dyes can be applied to Acrilan at temperatures around 205°F to give lightfastness very considerably in excess of that obtained on cotton. Under conditions of pressure at temperatures of 230°F a wide range of vat dyestuffs may be applied to Acrilan, again in many cases with fastness superior to that obtained on cotton. The key point in vat-dyeing Acrilan lies in the use of minimum amounts of caustic alkali in a pH range of 8-10. Up to this point, best results have been obtained with fiber in stock form, but there is indication that such piece-dyeing machines as the Barotor and the Burlington Machine Company's Arm Machine can be used to advantage. (See Example VI).

So-called soluble vat dyestuffs (leuco esters) can be applied to Acrilan in either stock or piece form. Piece goods can be dyed either by conventional padding methods or in rope form, where, in the presence of acetic acid, dyeing takes place at relatively low temperatures. It is very interesting to note that fabric dyed in this fashion can withstand a vigorous warm wash before oxidation without loss of the vat leuco. Even the Blue IBC type, which normally requires an intermediate drying before oxidation on cellulosic fibers, will withstand a 160°F wash before oxidation. This indicates how differently Acrilan and cotton behave toward leuco esters. The soluble vats possess the fastness properties expected of them, and, because of the fact that complete exhaustion can be obtained, are considerably less expensive than when applied to cotton or rayon. Although dark-medium shades can be obtained by this technique, colors beyond light-medium depth are not recommended because of the relatively poor penetration. It is very interesting to note that blends of Acrilan and cotton, when dyed by this method, produce a cross-dye effect in which the Acrilan is dyed and the cellulosic fibers are only lightly stained.

BLENDS

ACRILAN AND RAYON——Let us turn now to the question of dyeing blends of Acrilan with rayon. Because of what has been said about the use of disperse (acetate) dyestuffs on 100% Acrilan, it is

Example VI
Vat Blue on 100% Acrilan Staple

1) Set bath at 120°F

2) Add dyestuff
Sulfanthrene Blue 2B Dbl Pst 5.00% owf
Circulate pigment for 20 minutes while raising temperature to 180°F.

3) Add reducing agents and reduce dye
sodium carbonate 1.0 oz/gal
sodium sulfoxylateformaldehyde 1.0 oz/gal
sodium hydrosulfite .25 oz/gal
Add agents in order listed over a period of about 10 minutes. Raise temperature to 205°F, and hold 5 minutes.

4) Pressurize dye
Shut off external circulation, raise to 230°F in 15 minutes and hold for 30 minutes. Cool back to 180°F in 15 minutes and drop bath.

5) Rinse thoroughly at 140°F and oxidize and soap in fresh bath
sodium perborate 0.25 oz/gal
Igepon T gel 0.04 oz/gal
Raise to 205°F in 15 minutes, hold for 20 minutes. Cool back to 180°F, drop bath and rinse thoroughly.

Example VII
Solid Shades on 75/25 Acrilan-Rayon Blend

	% owf
1) Set dyebath	
Sandopan TLF	0.5
2) Add disperse dyestuff	
Celliton Black BTNA	7.5
	120 min @ 205°F
3) Add direct dyestuffs	
Bellamine Black RCW	0.85
Bellamine Blue BRN	1.00
common salt	20.00
	1 hr @ 185°F
4) Rinse well & light scour	
Igepon T gel	1.0
	20 min @ 110°F

obvious that a full shade range can be obtained by a single-bath method in which selected acetate dyestuffs are used together with selected rayon dyestuffs that meet the necessary fastness requirements. The dyeing operation is carried out at 205°F by methods which are in essence the same as for the dyeing of acetate and rayon, except for the higher temperature. The metalic complexes normally used for fixing direct colors on cellulosics and improving light fastness also appear to be of advantage for aftertreating disperse (acetate) dyestuffs on the Acrilan component. Washfastness at 140-160°F can be obtained, say on a 50/50 Acrilan-rayon blend, together with 20-40 hours' lightfastness. In blends where there is only a relatively small Acrilan component involved, apparent union dyeings have been obtained by dyeing the rayon conventionally and then adding acetic acid and raising the bath to a temperature of 205°F, at which point those direct dyestuffs that will normally dye wool will also transfer to the Acrilan component to produce apparent union. Although direct dyestuffs employed in this fashion penetrate well within the fiber, the lightfastness leaves much to be desired. Aftertreatment improves the washfastness of the direct dyes on the Acrilan, however, so that they are as fast on that fiber as on the rayon component. Where light, bright pastels are desired, basic dyestuffs can be used to advantage in a two-bath operation in which the Acrilan is first dyed with the basic dyestuffs, and then the rayon with direct dyes (See Example VII).

In view of what has been said regarding the excellent affinity of disperse (acetate) dyestuffs for Acrilan, it may seem contradictory to obtain clear and distinct 3-color effects on fabrics containing Acrilan, acetate and rayon where disperse dyestuffs are used exclusively on the acetate component. Nevertheless, by first dyeing the Acrilan component of a 3-way blend of Acrilan, acetate and rayon with neutral-dyeing acid or premetalized dyestuffs at 205°F in the presence of acetic or formic acid, the Acrilan is color-matched by conventional means. When the shade is obtained, there is introduced into the dyebath materials for which Acrilan has affinity, such as the nylon-resist salts, for the purpose of eliminating cross staining in the subsequent acetate-rayon dyeing operation. The dyebath is then neutralized, the temperature is allowed to drop to 160°F, and the acetate and rayon components are dyed by conventional means. It is important that the rayon dyestuffs be those that normally leave cellulose acetate white, and the acetate dyestuffs, those with low affinity. It is of interest to note that, although Acrilan has extremely good affinity for disperse (acetate) dyestuffs at temperatures of 200°F and above, at temperatures of 165-175°F in the presence of cellulose acetate, the selected disperse (acetate) dyestuffs do not even lightly stain Acrilan. The reduction of the temperature from 205 to 165°F prevents any further dyeing of the Acrilan by the neutral-dyeing or premetalized dyestuffs already in the dyebath, and the dyeing of the acetate and rayon follows strictly conventional lines with complete freedom from interstaining. (See Example VIII). The advantage to be obtained from this type of flexibility is obvious, particularly from a converter's standpoint, since it permits a blend of Acrilan, acetate and rayon to be dyed to produce five different colored effects.

ACRILAN-WOOL——It is now possible to discuss, publicly, radically new methods for dyeing blends of man-made fibers and wool. The fact that Acrilan

Example VIII
3-Color Dyeing on Acrilan-Acetate-Rayon Blends

A. *Acrilan* Ruby Red, *Acetate* Misty Dawn, *Viscose* Canary Yellow

	% owf
1) Dye Acrilan component in	
Xylene Fast Orange FR	0.43
Brill Alizarine Light Red B	2.00
formic acid	2.00
sulfuric acid	2.00
	90 min @ 205°F
2) Adjust pH to 6.5 with TSPP allowing temperature to drop	
3) Resist Acrilan Nylon Resist Salt GDC	2.00
	20 min @ 205-180°F
4) Cool dyebath back to 160°F and dye rayon and acetate	
Diphenyl Yellow RLSW	0.3
Eastman Blue BNN	0.04
Eastman Fast Brill Red 2BGLF	0.015
Eastman Fast Yellow LRFF	0.03
common salt	30.0
	90 min @ 160°F

B. *Acrilan* National Blue, *Acetate* Canary, *Viscose* Scarlet

	% owf
1) Dye Acrilan component in	
Brill Alizarine Blue BL	2.20
Brill Alizarine Light Violet	0.30
formic acid	2.00
sulfuric acid	2.00
2) Adjust pH to 6.5 with TSPP allowing temperature to drop	
3) Resist Acrilan Nylon Resist Salt GDC	2.00
	20 min @ 205-180°F
4) Cool dyebath to 160°F and dye rayon and acetate	
Eastman Fast Yellow 4 RLF	1.00
Chlorantine Fast Scarlet BNLL	1.60
common salt	30.00
	90 min @ 160°F

was originally designed to accept dyestuffs normally used on wool by wool-dyeing methods is, of course, the key point of this new method. However, this property in itself is not sufficient to promote the union dyeing of Acrilan and wool because of the lower diffusion rate of aqueous dyestuff solutions into the hydrophobic Acrilan acrylic as compared with the hydrophylic wool. The net result of dyeing Acrilan-wool blends by purely wool-dye-

ing techniques is that, by the time the dyestuff is exhausted from the bath, the wool component of the blend receives almost all of the dyestuff, leaving the Acrilan in lightly stained form. All attempts to balance the dyestuff between the two fibers by means of retarding agents or carriers were defeated because Acrilan requires temperatures of above 185°F for effective coloration, and at that temperature very many wool dyestuffs are already substantially dyeing the wool. In the preliminary work, however, it was found that sulfuric acid gave considerably improved results over acetic and formic acid.

Evidence had been accumulated as to the substantivity of many cation-active substances for Acrilan acrylic fiber which, on the basis of pretreatment, resulted in closer unions with Acrilan-wool than previously obtained, but their effectiveness decreased over the course of the dyeing cycle. Additions of the cation-active materials to an anionic dyestuff solution usually resulted in a bath break-out. However, it was found that, in the presence of a nonionic disperser, many dyestuffs in the over-all acid classification were not precipitated by the addition of cation-active materials, and the effect of this step was to slow substantially the dyeing rate of dyes on the wool. The use of this information, together with the previously developed conclusions as to the value of sulfuric acid, led to an investigation of the full range of the so-called acid dyestuffs with the result that by first wetting out Acrilan-wool blends in nonionic material, adding dyestuff, allowing circulation, adding cation-active materials and sulfuric acid, and dyeing for a period of 2 hours, we were able to produce effective unions between Acrilan and wool with 60 out of 120 dyestuffs tested. These dyestuffs were premetalized and level-dyeing acid types. The use of strong acid precluded the use of dyestuffs sensitive to sulfuric acid. However, further research developed the information that, by omitting the cation-active material at the outset, on dyeing the wool component in the presence of the nonionic assistant by methods standard for the application of that particular dyestuff, complete exhaustion of the dyestuffs onto the wool could be obtained as might be expected, but, and here is the key point, the addition of the cation-active material and sulfuric acid started up a transfer mechanism of the dyestuff from the wool to the Acrilan to produce union shades. This technique enabled the utilization of a considerable number of chrome dyestuffs to produce blacks, seal browns, navies, and a wide variety of union shades with superbly good fastness properties at costs differing from that of regular wool dyeing only by the cost of the cation-active material. Many neutral-dyeing types also were found to be of value, the chief exceptions being the neutral-dyeing premetalized dyestuffs, where apparently the use of sulfuric acid had adverse effect upon lightfastness.

Proper dyestuff selection was of primary importance, but, because of the large number of dyestuffs applicable by this process, an extremely wide color range with colorfastness of high order in both women's and men's wear shades was developed. During the course of the development of this dyeing method a number of wool dyestuffs were found capable of dyeing Acrilan very considerably heavier than wool, but these were the exceptions rather than the rule, but, nevertheless provide the basis for experimentation in the obtaining of cross-dye effects where wool dyestuffs will be present on both fibers in conceivably contrasting colors.

A variety of cation-active agents can be used, and work is still in progress on their evaluation. Atlas G-263 and Nopcotex A are among the most satisfactory materials tested thus far. The evidence to hand on the basis of plant-scale evaluation of this technique gives ample evidence as to its value as a practical tool. It represents a very major step in the dyeing of wool-synthetic blends, both from a cost and quality standpoint. (See Examples IX and X).

It should also be pointed out that Acrilan-wool blends can be dyed with selected disperse dyestuffs for the Acrilan by a one-bath method where neutral-dyeing acid types or neutral-dyeing premetalized dyestuffs are used for the wool. Although very satisfactory results have been obtained by this method, the ever-present difficulties regarding the staining of the wool component with the disperse dyestuffs is an adverse factor and, of course, contributes toward poor colorfastness unless carefully controlled. Womens-wear specifications can be met by this techniques, but, from a cost standpoint, the previously-referred-to dyeing approach offers very considerably greater advantage. Basic dyestuffs on Acrilan-wool blends can also be used advantageously for light and bright shades, but for medium to dark shades the cost becomes prohibitive, especially in comparison with chrome dyeings.

No shade range for blends of synthetics and wool would be complete without the ability to cross-dye, and this can be accomplished for Acrilan-wool blends by relatively simple means. As has been previously stated, the obtaining of even light shades on Acrilan in the presence of wool with acid type dyestuffs is dependent upon the use of sulfuric acid. With this in mind, it will be readily seen that, by using neutral-dyeing types and even metalized types in the presence of formic or

Example IX
Chrome Navy on Acrilan-Wool Blends

		% owf
1)	Pretreat	
	Emulphor ON	2.0
		15 min @ 120°F
2)	Add dyestuff	
	Erio Chrome Blue SE	3.0
	Omega Chrome Red DSR	0.5
	Pontachrome Blue SW	1.0
		15 min @ 120°F
3)	Add	
	Nopcotex A	3.0
	sulfuric acid	1.0
	Raise to 210°F in 45 minutes	
4)	Dye for 30 min @ 210°F and cool	
5)	Add sulfuric acid	3.0
6)	Dye for 60 min @ 210°F and cool	
7)	Add additional sulfuric acid	4.0
8)	Dye for 60 min @ 210°F, cool slowly and rinse	
9)	Afterchrome in fresh bath	
	bichromate	1.5
	sulfuric acid	2.0
		60 min @ 210°F
10)	Rinse and scour	
	synthetic detergent	1.5 g/l
	ammonia	1.5 g/l
		15 min @ 110°F

Example X
Metalized Brown on Acrilan-Wool Blends

		% owf
1)	Pretreat	
	Emulphor ON	3.0
		15 min @ 120°F
2)	Add dyestuff	
	Calco Fast Orange YF	1.35
	Vitrolan Red BRE	.18
	Vitrolan Black WA	1.53
	Irganol Green BLS	.36
	Neolan Bordeaux BE	.54
		15 min @ 120°F
3)	Add	
	Nopcotex A	3.0
	formic acid	4.0
	Raise to 210°F in 45 minutes	
4)	Dye for 30 min @ 210°F and cool	
5)	Add sulfuric acid	4.0
6)	Dye for 30 min @ 210°F and cool	
7)	Add additional sulfuric acid	4.0
8)	Dye for 90 min @ 210°F	
9)	Cool slowly, rinse well and scour to remove acid	
	synthetic detergent	1.5 g/l
	ammonia	1.5 g/l
		15 min @ 110°F
10)	Rinse	

Example XI
Black and White Effects—Acrilan White Wool Dyed

	% owf
1) Resist Acrilan	
Nylon Resist Salt GDC	3
	20 min @ 160°F
2) Wool dyeing	
Neolan Blue 2G	1.9
Neolan Violet Brown B	0.9
Palatine Salt O	2.0
formic acid	4.0
	45 min @ 200°F
formic acid	4.0
	45 min @ 200°F
3) Rinse well	

Example XII
2-Color Effects—Acrilan Turquoise—Wool Dk Brown

	% owf
1) Acrilan dyeing with basic dyes	
Set bath	
Peregal TW	2.0
ammonium acetate	1.0
Add color	
Diorlene Blue 5G	0.3
Sevron Blue B	0.06
	110 min @ 208°F
2) When Acrilan is matched drop temperature to 180°F and resist Acrilan with	
Nylon Resist Salt GDC	3.0
	20 min @ 160°F
3) Set wool dyebath	
Palatine Salt O	2.0
formic acid	4.0
4) Add wool dyestuff	
Neolan Brown R	1.0
Neolan Violet Brown B	0.3
	45 min @ 205°F
5) Additional acid	
formic acid	0.4
	45 min @ 205°F
6) Rinse well	

acetic acid, we can obtain only minor staining on the Acrilan component. However, in order to preserve optimum freedom from staining, it has been found that, upon pretreatment of the wool-Acrilan blend with materials such as Nylon Resist GDC, apparently the sites capable of accepting dyestuffs in the Acrilan become occupied, while the effect upon the wool component is of a minor nature. Under these conditions, a full range of color and white effects can be obtained. By first dyeing the Acrilan component with disperse (acetate) or basic dyestuffs in light and medium shades, followed by an addition of the Nylon Resist GDC and a subsequent dyeing of the wool by the weak-acid-dyeing technique, two-color effects can be readily obtained. Basic dyes can also be used similarly, where the Acrilan is first dyed to the required shade, followed by subsequent dyeing of the wool by the above-mentioned methods. (See Examples XI and XII).

ACRILAN-NYLON ——— The dyeing of Acrilan and nylon offers many interesting possibilities with considerable flexibility. By using strong acid metalized types from strong-acid solution, we can produce very effective unions between Acrilan and nylon with selected dyestuffs. Conversely, the use of acid dyestuffs for nylon capable of dyeing nylon at temperatures around 180°F in the presence of weak acid leaves the Acrilan either undyed or in a lightly stained condition readily capable of correction. Strongly contrasting cross-dye effects can also be obtained where the Acrilan is dyed light shades with disperse (acetate) or basic colors, and then the nylon is dyed a dark and contrasting color from a weak-acid medium.

The time available for this paper has not permitted a discussion in detail of many of the techniques referred to, nor is it possible to present to this whole audience readily discernible results on a fabric. However, at the conclusion of this meeting confirmatory evidence of the information developed in this paper will be available for the inspection of all those who are especially interested.

DISCUSSION

Question: What progress has been made in producing a better white on Acrilan?

Answer: We recommend a pretreatment with 4 g/l sulfuric acid at 205°F for 20 minutes followed by a bleach in 1 g/l Textone for 40 minutes at 160°F and a conventional antichlor treatment.

Q: Do you apply vat dyes on Acrilan only at 212°F?

A: No, indigoid and thioindigoid vat dyes are very suitable at temperatures of 212°F, especially in view of the fact that they are faster to light on Acrilan than on cotton.

Continuous Bleaching Process———

(Concluded from page P319)

For those who are interested, we have a number of samples of fabrics processed by the methods described. These may be examined at your convenience, and we shall be happy to discuss them with you now or later.

DISCUSSION

Question: Is there any change in the peroxide formulation in your process?

Answer: Yes, there must be to get the best result.

Q: Is it possible to get that?

A: Much of it is still in the experimental stage, and we have not yet settled upon many details. The effect of too much caustic soda, however, is evident from Figure 3. Our present object is to obtain the best possible formulation after the conclusion of more experimentation. We hope to be able to eliminate much mechanical handling.

Q: What is the difference in the data between total noncotton content and the content of oils, fats, and waxes?

A: The total noncotton content includes all the oils, fats, and waxes but not the ash. We separated the figures for our own guidance.

Q: Did I understand correctly that the absorbency was higher when the ash was higher?

A: Yes, and that was a surprise to us. Better absorbency always resulted when we used a gray sour.

Q: By better absorbency you mean a shorter time in seconds?

A: Yes, we use the AATCC Absorbency (Wettability) Method 39-52.

Q: In some work in our mill we found that it was easier to improve the whiteness than it was to remove motes.

A: Our work indicates that our single-stage processing method will eliminate seeds very well. We find that if we get the whiteness reflection over 85%, the seeds are pretty well removed. From our whiteness readings in the Hunter Reflectometer or even from experience alone in judging whiteness, we find the motes are gone when the whiteness is satisfactory.

Atlanta Convention
"Finishing of Textiles"——

APPLICATION OF THE THPC FLAME-RETARDANT PROCESS TO COTTON FABRICS*

JOHN D GUTHRIE, GEORGE L DRAKE, JR and WILSON REEVES

*Southern Regional Research Laboratory***
New Orleans, Louisiana

Tetrakis (hydroxymethyl) phosphonium chloride, abbreviated THPC, is the key chemical used in a process that imparts flame resistance to cotton fabrics. An aqueous solution containing THPC, methylolmelamine, urea, and triethanolamine is applied with a padder. Drying, curing, and washing follow. A softener may be incorporated into the treating solution. The functions of each of the components of the system are discussed in relation to changes in the formulation of the treating solution to meet various requirements. Laboratory applications of the process to various fabrics, such as marquisette, heavy belting duck, twill, sateen, blanket fabrics, napped fabrics, etc, are described.

INTRODUCTION

EFFORTS to develop better flame-resistant finishes for textiles have been intensified because of increased general interest in safety. Some of the currently available methods for making fabrics flame-resistant depend on the use of water-soluble salts, which must be removed after each laundering, while other available methods, although they impart flame-resistance having various degrees of fastness to washing, are not entirely satisfactory because of adverse effects on fabric properties or too high cost.

A rather unusual chemical compound has been found which can be applied in combination with other chemicals to cotton fabric to impart durable flame resistance. This key chemical is a crystalline compound, tetrakis (hydroxymethyl) phosphonium chloride, $(HOCH_2)_4PCl$, abbreviated "THPC" *(1)*. It is made by reacting phosphine with formaldehyde and hydrochloric acid. As a result of current interest in its possible use as a flame-retarding agent, at least one chemical company is now making THPC on a semiworks scale and can supply it for experimental trials. It is expected that THPC can be made on a large scale at a price low enough to permit it to be used commercially.

In the processing of cotton fabric, THPC is mixed with triethanolamine, methylolmelamine, and urea in aqueous solution. All of these chemicals are readily available commercially. Methylolmelamine is a chemical used to impart crease-resistance to fabrics and is sold under several trade names.

An aqueous solution of the above chemicals is applied to a fabric with a padder with a tight nip-roll pressure to keep the wet pickup at a minimum. It is often desirable to use two dips and two nips in this operation. The fabric is then dried at a relatively low temperature, cured at an elevated temperature, and washed by any of the usual washing procedures. A softener should be added to the treating solution or applied to the treated fabric.

TYPICAL APPLICATION

The process is illustrated by the following description of a typical laboratory application to 8-oz cotton twill:

PREPARATION OF SOLUTIONS——1) 1868 g of crystalline THPC (purity 95%) was dissolved in 1800 g of water, then 338 g of triethanolamine was added. 2) 1069 g of trimethylolmelamine (unmethylated) and 1114 g of urea were dissolved in 5062 g of water. In this particular experiment, the trimethylolmelamine was the trade product, Resloom HP *(3)*. Aerotex UM Special *(3)* could be used in this formulation.

PADDING——Solutions 1) and 2) were mixed, and 100 yards of 18-inch-wide, 8-oz OD twill was padded using 2 dips and 2 nips with a tight squeeze-roll setting. The wet pickup was 71.5%.

DRYING——The fabric was dried in 4.5 minutes by passing it through an oven at 185°F.

CURING——The fabric was cured 4.5 minutes by passing it through an oven at 288°F.

WASHING AND DRYING——The fabric was washed in a winch, first in cold water, then in hot water containing 0.1% Duponol LS *(3)* (flakes) and then rinsed in water. It was dried by passing it through the oven.

SOFTENING ——— The dried fabric was softened by padding with a 4% solution of a cationic softener to a 50% pickup. In this particular experiment, the cationic softener was the trade product, Triton X-400 *(3)*.

PROPERTIES OF THE TREATED FABRIC ———The fabric contained 16.6% resin, which withstood repeated laundering or drycleaning. Char length in the standard vertical flame test was 3.5 inches with less than 2 seconds afterflame (Fed Spec CCC-T-191 b, No. 5902). The fabric showed some afterflame, especially along cut edges, when a match was applied while the fabric was held in certain positions. An addition of about 20% would be required for this fabric to show little or no afterflame when tested with a match. The treated fabric, after softening, retained about 100% of its original warp tear strength (Elmendorf) and 100% of its original warp breaking strength. Considerable wrinkle resistance and rot resistance were introduced by the treatment.

NOTES AND PRECAUTIONS——Fabric can be processed on a continuous basis or stepwise. In either case it is padded in the resin-forming solution, dried, cured, washed, softened, and then dried.

All solutions should be made at room temperature, and heat should not be used to dissolve the chemicals.

The drying and curing ovens should be well vented. The possible toxicity of the fumes evolved during curing has not been investigated at this Laboratory. It is known that formaldehyde is formed during drying and curing, and it is possible that other toxic substances are evolved.

In general, fabric will receive a more uniform application if it is padded

* Presented before the Symposium on Finishing of Textiles in the Empire Room of the Atlanta Biltmore Hotel in Atlanta, Ga, on Sept 16, 1954, with Nelson F Getchell presiding. The work of developing this process was supported in part by the Office of the Quartermaster General.

** One of the laboratories of the Southern Utilization Research Branch, Agricultural Research Service, US Department of Agriculture.

through the resin-forming solution twice with a very tight squeeze-roll setting each time. With certain fabrics it may be necessary to incorporate a wetting agent into the treating solution. To prevent solution migration and stiffening of the treated goods, only moderate tension should be applied to the fabric as it comes from the padder, and it should be dried without tension as soon as possible at a temperature of about 185°F. Drying temperatures above 220°F cause surface curing before the inside of the yarn is dry. The length of time fabric is dried is not critical except that it must be dry before resin-curing begins. A loop dryer is suggested for drying and curing in order to minimize tension on the fabric and thus to reduce stiffness.

The length of curing is dependent on the temperature. A short cure time requires a high temperature and vice versa. The preferred temperature and time of cure will vary for different materials. Eight-ounce twill is adequately cured in about 4.5 minutes at 285°F. Much shorter times than this at the same temperature reduce the efficiency of the resin-forming solution but, fortunately, little or no harm is done if the fabric is cured up to twice as long. Prolonged cure times at temperatures above 285°F tend to reduce the tear strength of the fabric. The amount of resin add-on and curing conditions will have to be varied according to the type of fabric and degree of flame resistance required. It is suggested that mill trials be preceded by laboratory experimentation on the particular fabric to be processed. The amount of resin introduced into a given fabric should be varied by increasing or decreasing the concentration of all reactants in the treating solution proportionally, that is, by increasing or decreasing the amount of water in the solution. The amount of resin introduced should not be varied by merely using less nip on the squeeze rolls.

Fabrics should be completely desized before processing, since the presence of size imparts excessive stiffness.

Excess salts can be washed out of the cured fabric by almost any method, as they are water-soluble. The time and conditions of washing required for particular fabrics should be established by trial in each case. In our experimental work the duration of washing may have been longer than necessary.

The THPC treatment is compatible with a number of water-repellent treatments. Some of these act as softeners and improve the hand and tear strength. They may be applied after the treatment or, in some cases, may be incorporated into the resin-forming solution and applied in one padding and curing operation.

FUNCTIONS OF THE VARIOUS COMPONENTS OF THE SOLUTION

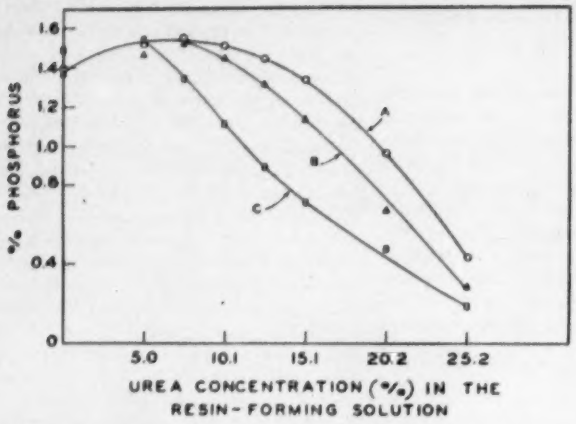
THPC———This compound furnishes the necessary phosphorus for imparting flame resistance by forming an insoluble, cross-linked condensation-type polymer with the melamine component. The chlorine is cleaved from this compound during the polymerization. The finished fabric contains essentially no chlorine. During polymerization with the melamine component, some of the THPC is converted to tris(hydroxymethyl)phosphine oxide, $(HOCH_2)_3PO$, which also enters into the condensation.

METHYLOLMELAMINE ——— Melamine and other polyfunctional amines, including urea, condense with THPC to form polymers. Methylolmelamine is used in the process because it is very soluble in water, while melamine itself is insoluble. Methylolurea could be used in the formulations if suitable modifications were made, but better results, especially in regard to durability, have been obtained with melamine derivatives. Methylolmelamine condenses with THPC much more rapidly than urea. Methylolmelamines are made by reacting formaldehyde with melamine *(2)* and may contain from one to six methylol groups, depending upon the amount of formaldehyde reacted. Any of these methylolmelamines form polymers with THPC, but, because of differences in water solubility and in other properties, some are more desirable in flame-retardant formulations than others. They become more water-soluble as the number of methylol groups increases. Trimethylolmelamine has been found to be very satisfactory in the typical formulation given above. Trimethylolamines as sold commercially are actually mixtures that have an average of approximately three methylol groups per molecule. For this and other reasons the trimethylolmelamines purchased under different trade names may differ somewhat in solubility or other properties.

UREA———This compound is used in the solution to combine with the hydrochloric acid formed during the polymerization and thus to prevent acid tendering. Even though the minimum amount of urea needed is associated with the amount of THPC in the formulation, it is difficult to calculate the amount of urea to use because some of the urea actually reacts with THPC to become part of the polymer and some of it decomposes during the high-temperature cure. The amount of urea needed has been established experimentally, and the effects of varying the concentration of urea in the typical formulation have been determined by curing the resin in 8-oz twill. Fabric treated with resin-forming solutions which contained no urea picked up only about 12 percent resin and was tendered, according to tear-strength measurements. As the urea concentration was raised to about 10 percent, the resin pickup increased to about 17 percent, and there was little loss in tear strength. Twenty-five percent urea prevented tendering, but this amount interfered with the polymerization of THPC and methylolmelamine to the extent that only about 5 percent resin was deposited in the fabric. The effect of various urea concentrations on the percent of phosphorus retained by the fabric and on the durability of this phosphorus to washing is shown by Fig 1. It may be noted that the 9.9 percent urea used in the typical formulation gave excellent permanence to 10 launderings with Igepon T *(3)* followed by a laundry sour in accordance with Federal Specification No. CCC-T-191 b, test No. 5556, but that considerable loss of phosphorus was observed after boiling for 3 hours in a soap and soda solution. Better durability to this type of treatment may be obtained by using less urea. Satisfactory permanence to soap and soda washes may be obtained by using about 7.5 percent urea (in solutions containing 16 percent THPC and 9.7 percent methylolmelamine) while maintaining tear strength adequate for most purposes.

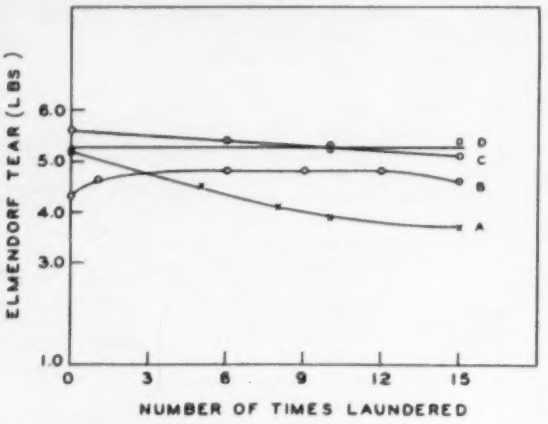
TRIETHANOLAMINE ——— This is used to stabilize the resin-forming solution at room temperature. Treating solutions from which triethanolamine is omitted polymerize to a viscous liquid or even to a gel within a few hours at room temperature. The use of such viscous solutions results in surface deposition of the polymer and imparts stiffness to the fabric. A preferred range of triethanolamine concentration is equivalent to about 1/5 to ¼ of the THPC concentration. Amounts of triethanolamine somewhat greater than suggested do not affect the quality of the fabric, but excessive amounts impair the durability of the flame resistance.

SOFTENERS———A softener is usually necessary to give satisfactory tear strength, and there are a number that may be used with good results. Those that are substantive to cotton appear to be especially good, and, in some cases, flame-resistant fabrics treated with them show about the same tear strength as the untreated fabric when both are put through a series of launderings. This is illustrated by Fig 2, which shows the effect of two long-chain amino compounds, cetylamine and stearamide, on the tear strength of treated and control



A—Phosphorous introduced by the resin treatment.
B—Phosphorous remaining after 10 launder cycles.
C—Phosphorous remaining after 3 hr boil in soap and sodium carbonate solution.

Figure 1
Effects of urea concentration upon the durability of phosphorous in THPC-resin-treated fabric. The resin-forming solution contained 16% THPC, 9.7% Resloom HP, and 3% TEA.



A—Untreated control.
B—THPC-resin—Treated.
C—THPC-resin—Treated with 0.5% cetylamine as softener.
D—THPC-resin—Treated with 0.5% stearamide as softener.

Figure 2
Effect of laundering upon the tear strength of THPC-resin-treated 8-oz twill with permanent-type softener as compared with untreated control fabric.

fabric at various stages of laundering with Igepon T *(3)*. It will be noted that in this case the tear strengths of the softened treated samples were somewhat greater than those of the control sample through 15 launderings. This is not true of all fabrics made flame-resistant by the process; certain fabrics, especially those of tight construction, may have lower tear strength than the untreated fabric even when a softener is used. This is especially true when a very high degree of flame resistance is required, which necessitates a high resin add-on.

APPLICATION OF THE PROCESS TO VARIOUS FABRICS ——— The process has been applied on a laboratory scale to a wide variety of fabrics. The experimental details of some of these applications are summarized in Table I and Table II. The fabrics tested in Table I were treated to obtain sufficient flame resistance to pass the standard vertical flame test. It will be noted that lower dry add-ons of the flame-retardant resin are required for heavyweight fabrics than for lightweight fabrics. Comments concerning the fabrics listed in Table I are as follows:

1) Cotton Belting, 28-oz. The treatment had no noticeable effect on the flexibility of this fabric. It would accept an add-on of as high as 20 percent without noticeable change in properties.

2) Cotton Blanket. Particularly good results were obtained with cotton-blanket fabrics. At a 14 percent add-on there was a slight but not objectionable change in hand and a little increase in firmness of the nap. The treatment imparted considerable resistance to shrinking.

3) Cotton napped bathrobe fabric. The treated fabric was noticeably stiffer than the untreated sample. Some migration of dyes in the pattern due to the wet processing was noted.

4) Cut-pile cotton rug. This was backed with rubber, but it accepted the treatment very well. It was necessary to brush up the pile prior to drying and curing. The improvement in flame resistance in comparison with untreated samples was very striking when tested by the method indicated in the table.

5) Cotton sateen. The treated fabric was only a little less flexible than the un-

TABLE I

APPLICATION OF THPC FLAME-RETARDANT PROCESS TO VARIOUS FABRICS

No.	Kind of Fabric	Composition of Solution					Softening Method[2]	Wet Pick-up	Dry Add-on of Resin	Char length inches
		THPC[3]	Methylol-melamine	Urea	TEA	Wetting Agent				
		%	%	%	%	%		%	%	
1	Cotton belting, 28-oz	15.5	9.3	9.8	3.9	1.0	B	53.3	11.6	0.3
2	Cotton blanket, 10.7-oz	11.1	6.7	5.2	2.8	—	C	86.6	14.2	1.3
3	Cotton napped bathrobe fabric	16.5	10.0	7.8	4.1	1.0	E	72.1	11.5	2.3
4	Cut pile cotton rug	13.6	8.2	8.6	3.4	1.0	E	50.3	7.4	2.2[1]
5	Cotton sateen, 8.5-oz	17.5	10.5	11.0	4.4	—	C	70.1	18.0	3.2
6	Mercerized cotton drapery, 8.4-oz	16.9	10.2	10.7	3.5	—	A	77.1	20.0	3.3
7	Upholstery fabric, cotton warp, wool filling	15.3	9.2	9.6	3.0	—	A	79.3	16.0	1.9
8	Cotton whipcord	21.1	12.8	6.7	5.2	—	D	78.5	21.6	2.4
9	Bleached cotton sheeting	16.8	10.2	7.9	4.2	—	D	90.2	22.6	3.7
10	Viscose rayon, 8.3-oz	19.1	10.9	11.4	3.5	—	A	83.1	20.1	2.1
11	Viscose napped flannel, cotton warp	15.4	9.3	9.7	4.1	—	A	107.6	25.8	3.1
12	Cotton oxford, 6.5-oz	18.1	10.9	11.4	4.5	1.0	B	77.6	23.2	3.8
13	Cotton percale, 4-oz	16.4	9.9	7.8	4.1	—	C	87.1	20.0	3.7
14	Cotton marquisette	15.7	9.4	9.9	6.2	—	A	137.6	32.7	5.2
15	Low-count cheese cloth	15.3	9.2	9.6	3.4	—	B	127.8	28.9	4.0

[1] As tested by proposed test for flammability of rugs, ASTM Meeting, New York, Oct, 1952, by Committee D-13, Sub-Committee A-11(1952).
[2] See Softening Methods in Table III.
[3] Approximately 95 percent purity.

TABLE II

APPLICATION OF THPC FLAME-RETARDANT PROCESS TO VARIOUS FABRICS

Kind of Fabric	Composition of Solution					Softening Method[1]	Wet Pick-up	Dry Add-on of Resin	Flammability Class[3]
	THPC[2]	Methylol-melamine	Urea	TEA	Triton X-100				
	%	%	%	%	%		%	%	
Napped soft filled sheeting, 3.2-oz	7.1	4.1	4.3	1.8	—	A	90.9	8.0	I
Viscose napped flannel, cotton warp, 4.2-oz	6.5	3.7	3.9	2.5	—	A	106.0	9.0	I
Cotton napped flannel, 3.7-oz	6.5	3.7	3.9	2.5	—	A	98.4	8.9	I
Lightweight viscose rayon	8.7	5.2	4.1	2.2	—	B	101.7	9.5	I
Heavy unnapped viscose knit cloth, 6-oz	9.5	5.8	4.5	2.4	—	B	96.4	12.2	I
Cotton-mesh under-skirting material, 3-oz	6.7	4.1	4.0	1.7	1.0	B	86.0	7.0	I
Viscose rayon mesh under-skirting material, 2.6-oz	6.7	4.1	4.0	1.7	1.0	B	140.8	9.9	I
White cotton blanket, 10.7-oz	7.0	4.2	3.3	1.7	1.0	C	70.4	7.2	I
Silk scarf	17.0	7.0	0.0	3.4	1.0	F	92.0	12.2	I

[1] See Softening Methods in Table III.
[2] Approximately 95 percent purity.
[3] Commercial Standard CS 191-53.

treated and showed considerable crease resistance. There was some loss of tear strength.

6) and 7). These fabrics accepted the treatments very well without adverse effects on their properties.

8) Cotton whipcord. Since it was expected that this work-clothing fabric would be subjected to highly alkaline laundering at high temperatures, a low amount of urea was used in the formulation to obtain high durability. The tear strength was lowered but was probably acceptable.

9) Bleached cotton sheeting. A high add-on was applied to obtain relatively high flame resistance. The fabric appeared to be a bit too stiff.

10) Viscose rayon. The treated fabric had excellent flexibility and good crease resistance.

11) Viscose napped flannel. Particularly good results were obtained with this fabric. The effect of the high add-on was hardly noticeable.

12) and 13). Rather high add-ons were needed on these fabrics to obtain the required flame resistance. This imparted noticeable stiffness and some reduction in tear strength.

14) and 15). These lightweight fabrics were stiffened by the high add-on required to pass the vertical flame test, making them unacceptable for some uses.

The fabrics listed in Table II were treated to reduce their flammability so that they would be in Class I according to the 45-degree flammability test. Some of them may have been in Class I prior to treatment. It may be noted that relatively low add-ons are needed for this purpose, and, consequently, the effect on fabric hand was hardly noticeable. In the case of silk, urea did not seem to be necessary in the formulation.

It may be noted in connection with the application of the process to various fabrics that it is effective on the hydrophilic fibers, such as cotton, viscose, fortisan, silk and wool, but ineffective on hydrophobic fibers, such as acetate, nylon, Orlon and Dacron.

TABLE III

SOFTENING METHODS FOR TABLES I AND II

A) After the THPC resin treatment, the fabric was padded through a 2% solution of Triton X-400 *(3)* and then dried.
B) No softener.
C) 2% of the THPC resin-forming solution consisted of Sapamine WL softener *(3)*.
D) Same as "A" except 6% Triton X-400 *(3)* was used.
E) Same as "A" except 4% Triton X-400 *(3)* was used.
F) Same as "C" except 4% Sapamine WL Softener *(3)* was used.

PROPERTIES OF FABRICS TREATED BY THE PROCESS

FLAME RESISTANCE AND GLOW RESISTANCE———The amount or degree of flame resistance is dependent upon the amount of resin put into the fabrics and upon fabric construction. Only about 10 percent resin is required in 32-oz duck belting for it to pass the standard vertical flame test (Fed Spec CCC-T-191 b No. 5902), whereas, about 32 percent is required for 2-oz marquisette. Resin pickup as low as 13 percent imparts sufficient flame resistance to 8-oz twill for it to pass the standard vertical flame test, but about 16 percent resin is recommended to give it greater flame resistance.

The resin add-on required to meet the standard vertical flame test is greater on lightweight fabrics than on heavy fabrics. With closely woven cotton fabrics weighing less than 8 oz per sq yd, the amount of resin needed to pass the standard test may impart excessive stiffness. Furthermore, recent observations have indicated that light fabrics treated by the process, although passing the standard vertical test, may exhibit inadequate flame resistance for some uses, since they might support a flame when lighted in certain ways with a match.

If the object of treating the fabric is to remove it from the dangerously flammable class in accordance with the requirements of Commercial Standard CS 191-53, less add-on is required than is needed to pass the standard vertical class. Most fabrics of this type are put into Class I (normal flammability) with 10 percent or less resin add-on.

DURABILITY OF FLAME RESISTANCE———In general, the durability of the flame resistance to laundering of various types is excellent. This may be explained on the basis of the formation of a highly cross-linked, insoluble polymer inside the cotton fiber. It is of interest to note in this connection that the acid stripping agents that are effective in removing the melamine-formaldehyde and urea-formaldehyde crease-proofing resins from fabrics do not remove the THPC-melamine flame-retardant resin from fabric.

Fabrics made flame-resistant at this Laboratory with the above typical formulation passed the standard vertical flame test after 15 launderings with Igepon T *(3)* followed by a laundry sour in accordance with Federal Specification CC-T-191 b, test No. 5556. Little or no loss of resin, based on phosphorus and nitrogen analyses, is observed during such washes. The flame retardant is especially durable to washing with synthetic detergents. Some applications of the THPC formulation show about 20 percent loss of resin on boiling in soap and soda solutions for 3 hours. Better durability of the flame retardant to such treatments may be obtained by greater original resin add-on or by decreasing the amount of urea in the treating solution. Use of 7.5 percent urea instead of the 9.9 percent given in the typical formulation is suggested where tear-strength requirements are not critical.

A very important property of materials made flame-resistant with THPC resins is that the goods are also glow-resistant. The glow that usually persists after the flame of burning cotton is ex-

tinguished often completely consumes the fabric, but the afterglow of THPC-resin-treated fabrics usually lasts less than two seconds.

TEAR AND BREAKING STRENGTHS ——— Many resin treatments, especially with the urea-formaldehyde resins, reduce both the tear and breaking strength of cotton fabrics by about 35 percent when about 15 percent of the resins is put on the goods. The THPC resins have little effect upon the breaking strength but do, in general, reduce the tear strength somewhat. The loss in tear strength depends on the kind of fabric, a very tightly woven fabric being apt to lose more tear strength than a loosely constructed material. The application of a softener to THPC-resin-treated fabric brings back the tear strength of many fabrics to about equal that of the untreated goods.

CREASE RESISTANCE ——— Fabrics processed with THPC resins show improved crease resistance, often as much as 30 percent as measured by the usual tests. This property may be of value in certain uses, especially in clothing. There is also some evidence that the treatment imparts considerable resistance to shrinkage.

MILDEW RESISTANCE AND WEATHER RESISTANCE——— For uses such as tentage materials and awnings, flame-resistant goods are often treated with a mildew- or rot-proofing agent to protect them from micro-organisms. Such an aftertreatment may not be necessary for goods treated with THPC resins because the resin itself protects the materials. The soil-burial test has been used as an accelerated method of determining the resistance to micro-organisms of fabrics treated wtih THPC resins; samples of 8-oz twill have retained 85 percent breaking strength after 112 days in the soil, whereas untreated twill retained only 3 percent strength after 10 days.

Some THPC resin-treated 8-oz fabric has been exposed to rain and sunshine for three months in a warm humid climate without any visible mildew formation. In this same experiment, untreated fabric contained a considerable amount of mildew in three months. However, samples exposed to weather for more than 3 months no longer passed the standard vertical flame test.

POSSIBLE DERMATITIS EFFECTS ——— As a result of preliminary tests made by the Army Environmental Health Laboratory, the THPC flame-retardant treatment has been approved from a skin-toxicity standpoint for use in tentage fabrics, which are of a casual contact nature; and for use in cotton outer garments. No reports have been received of fabrics treated by the process having caused skin irritation. Nevertheless, it is recommended that adequate tests be made on any particular fabric that might be used in intimate contact with the skin.

SUMMARY

A rather unusual chemical compound has been found which can be applied in combination with other chemicals to cotton fabric to impart durable flame resistance. This key crystalline compound is tetrakis(hydroxymethyl) phosphonium chloride, $(HOCH_2)_4PCl$, abbreviated "THPC".

The treatment can be applied on standard chemical-finishing equipment. An aqueous solution of THPC, trimethylolmelamine, urea, and triethanolamine is applied to fabric with a padder with a tight nip-roll pressure. The fabric is then dried, cured at an elevated temperature, and washed by any of the usual washing procedures. A softener may be added to the treating solution or applied to the treated fabric.

Eight-ounce twill containing about 16 percent of the THPC resin will pass the standard vertical flame test. The resin is durable to laundering. In addition to being flame-resistant, treated fabric is also glow-resistant. Considerable wrinkle resistance and rot or mildew resistance are imparted by the treatment.

The process has been applied to a variety of fabrics on a laboratory basis, and the results have been favorable in most cases. The details of processing depend on the kind of fabric and the degree of flame resistance required. Heavy fabrics require less add-on of the THPC flame-retardant resin than light fabrics to obtain a given degree of flame resistance. Comparatively low add-ons are sufficient to remove certain fabrics from the dangerously flammable class when evaluated by the 45-degree flammability test.

ACKNOWLEDGMENT

The authors wish to express their appreciation to members of the Analytical, Physical-Chemical and Physics Section for breaking- and tearing-strength and crease-resistance determinations and for chemical analyses.

LITERATURE AND NOTE

(1) Reeves, Wilson A, and Guthrie, John D, "Agriculture and Industrial Chemistry", AIC-364, Nov 2, 1953 (Revised May 11, 1954).

(2) Soc *pour l'ind chim a Bale*, French Patent 811,804 (1937); British Patent 468,677.

(3) This name is given for convenience only and is not to be construed to be a recommendation by the U S Department of Agriculture over equivalent products of other companies. Equivalent products may be used if suitable modifications in amounts and processing conditions are made.

DISCUSSION

Question: In your presentation of the curing process you said the curing time was five minutes. If you would extend the time to 20 minutes, what temperatures would you employ?

Answer: As we have not tried such a long curing time, I can not answer you exactly. The temperature would be much lower, probably 160 to 180°F.

Q: What is the function of the methylolmelamine?

A: It forms a polymer with the methylol groups of THPC. Melamine can be made to work in the same way, but melamine is not readily water-soluble and it would be very difficult to control the condensation of gradually dissolving melamine with THPC in hot solution. The ready solubility of methylolamine makes it easier to use.

Q: Suppose you left out both formaldehyde and melamine, would you still get flame resistance?

A: Probably not without excessively long curing times. It is possible but not practical to use a polymer with the urea and THPC without methylolmelamine.

Q: You did not mention a catalyst.

A: Yes, because THPC acts as its own catalyst.

NOTICE

To Authors and Section Officials

Under a new ruling of the Publications Committee, all papers presented before local sections of AATCC must be submitted direct to the managing editor of the AMERICAN DYESTUFF REPORTER, 44 East 23rd St, New York 10, N Y. Two copies of each manuscript should be submitted in accordance with the "Notice to Authors", which appears periodically in the *Proceedings*.

ABSTRACTS

Readers desiring complete copies of the articles abstracted below are requested to write direct to the publication indicated. The various addresses are as follows:
The Dyer———Drury House, Russell St, Drury Lane, London, WC 2, England
Textile Research Journal———10 East 40th St, New York, N Y
Textile Journal of Australia———19-47 Jeffcott St, Melbourne, Australia
Papers of the AATT———c/o Modern Textiles, 303 Fifth Ave, New York, N Y
Canadian Textile Journal———223 Victoria Ave, Westmount, Montreal 6, Quebec, Canada

Printing of Cellulose Acetate Fabric by Roller———A General Survey

W B Miller, *Dyer* 112, 1015-21, December 10, 1954.

This article is concerned only with the roller printing of fabrics containing cellulose acetate, and has been written on the assumption that the reader is familiar with the general principles involved in roller printing as practised on various fibers and on cotton in particular. Cellulose acetate is a thermoplastic material, relatively hydrophobic in character, and its coloration depends to a large extent on the use of special classes of dyes or on application of the more usual dyes by special methods.

The article contains much detail that should be of interest to the acetate printer, and should be read in its entirety. Following is a summary of the more important items.

Being hydrophobic, acetate is not nearly as absorbent as cotton, and a scale and depth of engraving that would suit the latter would probably flush over the outline on the former fabric. A finer scale and shallower engraving are usually needed.

The fit of the pattern requires special care, as the fabric stretches when wet, starting when it reaches the first roller.

Disperse dyes are most commonly used. The preferred thickenings are crystal gum and methyl cellulose, but gum tragacanth and locust bean are also useful. Starch is little used. Prints are steamed for 45-60 minutes in the continuous steamer.

Vat dyes are employed for faster-to-washing prints; dyes of the Indigoid type are mainly used. Fabrics dyed with suitable disperse dyes can be color discharged by the usual potash-sulfoxylate vat paste, if necessary with a swelling agent, such as barium thiocyanate. The usual oxidizing agents are used after aging vat dyes, but the leuco vat dyes oxidize more slowly on acetate than on cellulose. A new process for vat color discharges, employing thiourea dioxide, is also described.

Acid dyes are used for direct printing by the use of a special swelling technique. The dye is usually dissolved in alcohol, thickened with methyl cellulose, printed with the addition of ammonium thiocyanate, and steamed for 45-60 minutes. —WHC.

Physical-Chemical Studies Related to the Role of Whiteness-Retention Additives in Detergent Action

W Fong and W H Ward, *Textile Research J* 24, 881-9, October, 1954.

Several explanations have been proposed for the action of whiteness-retention additives in preventing the redeposition of soil during laundering. The ability of an additive to maintain soil in suspension has been said to play an important role.

Previous studies at the Western Utilization Research Branch (USDA) have shown that several proteins and certain nonionic water-soluble synthetic polymers exhibit whiteness-retention properties similar to those of sodium carboxymethyl cellulose (CMC), an additive widely used in detergent formulations to inhibit soil redeposition during laundering.

Physical-chemical studies have been carried out by the authors related to the mode of action of whiteness-retention additives in decreasing the extent of soil redeposition. For this purpose the methods of electrophoresis, sedimentation, and adsorption analysis have been used.

Electrophoretic measurements indicate that the ionogenic additives, CMC and to a lesser extent gliadin, increase the negative surface charge of cotton, whereas the nonionogenic additives polyvinylpyrrolidone (PVP) and polyvinyl alcohol (PVA) have no observable effect. None of the additives alters the surface charge of the carbon black test soil. Ultracentrifugal measurements show that the nonionogenic additives have little or no effect on the rates of sedimentation of carbon black particles. On the other hand, the ionogenic additives, CMC and gliadin, produce decreases in sedimentation rate in order of their charge. Adsorption measurements show that PVP is highly substantive to carbon black and relatively nonsubstantive to cotton, in contrast to the behavior of CMC, which is known to be highly substantive to cotton. Evidence of interaction between the nonionogenic additives and detergent is presented.

The ionogenic additives, therefore, differ from the nonionogenic additives in their specific effects on the surface charge of cotton, on the rate of sedimentation of carbon black, and in their adsorption on cotton, and it is concluded that their modes of action in preventing soil redeposition are different. The ionogenic additives apparently influence whiteness-retention action by their effect on the surface of the cotton, probably through increase in electrostatic repulsion between fabric and soil. On the other hand, the nonionogenic additives apparently act at the surface of the carbon test soil, possibly through reduction in van der Waals' attraction between fabric and soil.

Twenty-four references to the literature are cited.—WHC.

Notes on Chlorite Bleaching

L Keiner and H Bergs, *Textile J Australia* 29, 939-49, 966, October, 1954 (from *Z ges Textil-Ind*).

The chief advantage claimed for chlorite bleaching, in addition to an "extraordinary protective action on the fiber," is the high bleaching speed, according to the authors. They state that the methods of activation for chlorite currently described in the literature and patents, eg, with the aid of sodium hypochlorite, aldehydes, or persulfate, although they avoid to some extent the danger of corrosion and objectionable odors, do not offer the same advantages as chlorite bleaching with acid.

For this purpose, both organic acids, such as acetic, formic, or oxalic acid, and inorganic acids, such as sulfuric, hydrochloric, and phosphoric acid, may be used. In practice, organic acids, preferably formic, are generally employed.

The selection of the pH of the chlorite bath is of great importance. The optimum value is stated to be about pH 3.5.

The authors give instructions for preparing the bleach bath, to which are added, besides the chlorite and formic acid, acid sodium pyrophosphate and a wetting agent stable to acid. The pyrophosphate controls the rate of decomposition of acid chlorite solutions, and it is said also to lessen the development of odor and corrosion.

The temperature of the bleach bath is important. A high temperature (203° F) gives the maximum bleaching effect in the shortest time.

The effect of the chlorite bleach on dyes does not run parallel to that of a hypochlorite bleach; eg, certain vat dyes used successfully on colored yarns in conventional bleaching are destroyed by chlorite.

There is a long discussion of the materials required for the bleaching apparatus, with illustrations of several German machines suitable for this work.—WHC.

Application of the Silicone Resins to Textile Fabrics

F Fortess, *Papers AATT* 10, 20-28, December, 1954.

The author points out that finishes employing urea- and melamine-formaldehyde act by absorption into the individual fibers and react internally to cross-link and basically modify the fiber properties. The silicone resins represent a completely different approach. These resins are primarily located on the surface of each individual fiber and impart their various useful effects as a function of the silicone film properties—hydrophobicity and low interfiber friction.

Durable water repellency, improved abrasion resistance and tear strength, increased recovery from wrinkling, resistance to aqueous-borne stains, improved sewability, and the modification and improvement of the drape and hand are only a few of the useful effects imparted to fabrics by the proper use of the silicone resins, according to the author. In general, these improvements in fabric properties can be related to the hydrophobic, tough, flexible film of silicone resin formed around each individual fiber.

The term "silicone" was originally assigned by Dr F S Kipping about 40 years ago to a family of silicon compounds in which he found one atom of oxygen to each atom of silicon. The author describes the chemistry of the silicones, starting from silica, SiO_2, in the form of sand or quartz. This is reduced to the element silicon, which is then reacted with anhydrous hydrochloric acid, chlorine, or methyl chloride, to produce a wide variety of materials (eg, silicon tetrachloride) that serve as the starting point in the formation of the silicone resins. Compounds containing methyl, ethyl, vinyl, and other groups have been prepared, with a wide range of physical properties from free-flowing liquids and heavy syrups to brittle solids.

The silicone resins are applied to the fiber in the form of emulsions, with the addition of suitable metallic catalysts, and are cured generally for about 4 to 8 minutes at 320-340°F. The result is an insoluble film surrounding each individual fiber.

Durable water repellency is still the primary reason for the use of the silicones, according to the author. It has been produced on a variety of fibers and blends, including nylon, Dacron, and acetate, as well as cotton.

The author mentions that silicones may be combined with urea- and melamine-formaldehyde resins, and also with a variety of vinyl polymers, to obtain modified hand and other properties. —WHC.

The Use of Nylon in the Rubber Industry

H C Mersereau, *Can Textile J* 71, #23, 71-3; #25, 69-74; November 19 and December 17, 1954.

The importance of the textile industry as a source of supply for the rubber industry can scarcely be over-estimated. It is stated that some 90 percent of the products of the rubber industry contain a textile component. Until 15 years ago most of the fiber consumption was cotton. Today well over 50 percent of the total is high-tenacity rayon, which monopolizes the tire cord market and has made inroads into the belting and other fields.

Nylon has now made its presence felt in the rubber industry, particularly in military aircraft tires and to a lesser extent in other articles (eg, footwear and rubber-coated fabrics).

Among the advantages of nylon for these purposes are its high tensile strength, which is superior on the average to that of all other fibers, and its elasticity, which is of great importance in most rubber applications. The adhesion between nylon and rubber is said to be in no way inferior to that between rayon and rubber. Nylon's resistance to bacterial and chemical attack is another advantage over the celluloses.

During the latter part of World War II considerable quantities of very light-weight nylon fabric were coated with rubber or vinyl compounds for fabricating into waterproof capes for the armed forces. By using an open-weave nylon fabric which would allow the coating material to strike through from both sides, a very light, strong, waterproof fabric was produced.

Since the war, nylon-coated fabrics have been used for aircraft wing covers, light-weight rainwear, and numerous other items, including rubberized pontoons for bridge construction, life rafts, and portable storage tanks. Nylon in the wall of various light-weight hoses is a recent development that deserves mention. Many other applications are in their early stages, according to the author.—WHC.

Work on Dyestuffs at High Temperature

M R Fox, *Can Textile J* 71, 51-3, December 3, 1954

The introduction of the polyester and acrylonitrile fibers has encouraged considerable research work in the field of high-temperature dyeing. It is natural for those interested in the dyeing of natural and regenerated celluloses to inquire whether the application of dyes to these fibers at temperatures above the atmospheric boil holds out any hope of speeding output or improving results. Makers of dyeing machinery have made marked progress in the development of equipment which will operate safely at temperatures up to 300°F, and probably the largest deterrent to the wholesale adoption of such processes (where they are deemed necessary) is the paucity of dyes sufficiently stable to such high temperatures.

The ICI dye laboratories in England have examined both direct and vat dyes for stability and dyeing behavior at high temperatures, and have concluded that for certain types of work the use of high temperatures holds out some useful advantages.

Of 114 direct dyes classified, about 10 percent were found to be stable at 250°F under neutral or alkaline conditions. About 78 percent were stable under neutral conditions, but were adversely affected in yield, shade, or fastness properties when applied under alkaline conditions. The remaining dyes, about 11 percent of the total, were found to be unsuitable under either neutral or alkaline conditions. It is evident that the largest single factor affecting the stability of direct dyes at temperatures greater than the atmospheric boil is that of the pH of the dyebath.

To date, according to the author, the employment of direct cotton dyes at temperatures in the region of 250°F has only found employment for application to viscose rayon cakes, since it is in this field that major difficulties are encountered in the production of level dyeings. Use of the high starting temperature, eg, 230-250°F, promotes rapid diffusion of dye into the fiber, lowers the initial strike, and thus creates a good foundation for level dyeing.

Turning to the vat dyes, the employment of caustic alkaline reducing agents at temperatures over 212°F damages viscose yarn, and is of value only on cotton. However, pigmented vat dyes may be applied at high temperatures on viscose and subsequently reduced at normal temperatures.

The lack of stability of leuco vat dyes at high temperatures may be due to hydrolysis, dehalogenation, or over-reduction. The author gives examples of vat dyes in each of these categories and explains the chemistry involved. He states that the most resistant vat dyes to high-temperature application conditions are those devoid of halogens, acylamino groupings, and pendant amino-anthraquinonoid groupings. A list of such dyes is included.

The author states that these high-temperature dyes will give good penetration and levelness on mercerized sewing yarns in package form, if dyeing is commenced at 250-260°F and the temperature gradually lowered.—WHC.

News of the Trade

• Croft Works Producing Fast Colors

Production of fast colors is now in full swing at the Croft Works, Spartanburg, S C, on the site purchased last August by Alliance Color & Chemical Co and Blackman-Uhler Co, then newly merged into The Andover Co. Naphthols are the principal output of the new plant.

The Croft Works is under the direct supervision of Harold W Coward, president of Alliance Color & Chemical Co, who is in charge of manufacturing operations for all Andover divisions.

Erwin Thornton, who had been in charge of the Blackman-Uhler laboratories, has been appointed superintendent. Donald Belcher, formerly Mr Thornton's assistant, has been promoted to the position previously held by Mr Thornton. Walter E Eskew, until recently a technical consultant to Blackman-Uhler, has now joined the Company as technical director of the Croft Works.

According to Harold W Rose, president of The Andover Co, the additional capacity of this plant makes the Company and its divisions the largest exclusive manufacturers of fast colors in the United States.

Specifically, it was pointed out, the Croft Works, supplementing the Alliance plant at Newark, N J, is providing 1) important additions to the line of naphthols; 2) increased over-all productive capacity; 3) same-day or over-night deliveries throughout the South; 4) more laboratory facilities to devote to customer problems.

The Newark plant continues to produce the bulk of the Company's fast color salts and bases. The Croft Works, in addition to naphthols, is also producing Azogen printing colors and Buco tints, formerly manufactured by Blackman-Uhler in Spartanburg.

Front view, showing laboratory and offices, of the new Croft Works of the Blackman-Uhler Manufacturing Co, recently opened at Spartanburg, S C.

• Commonwealth Lectures Begin at LTI

Brigadier General Charles G Calloway, commanding general of the Quartermaster Research and Development Branch at Natick, Mass, inaugurated the 1955 series of Commonwealth Lectures at Lowell Technological Institute on April 21st with a talk on "Research."

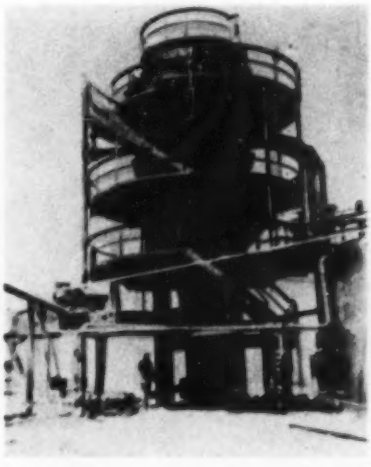
Theme of this year's series of lectures is "New England Looks Ahead," and subsequent programs will deal with "Industry" and "Education."

The Commonwealth Lectures are open to the public.

• New Natural Source of Sodium Sulfate

West End Chemical Company will start producing salt cake and high-quality anhydrous sodium sulphate by approximately midsummer, 1955, it is learned. It will be extracted from the natural brine deposits at Searles Lake, Calif and processed by special equipment now under construction.

The evaporator is a vital part of the new processing technique. Designed and patented by H D Hellmers, vice-president and J V Wiseman, research director, it is the first of the major equipment now completed and in place. It is reported that initial production will be at the rate of 50,000 tons annually.



Evaporator at West End Chemical's Searles Lake, California Location

• Textile Engineering Division, ASME, to Meet June 23

New technical data relating to the processing of high bulk synthetics will be presented when the Textile Engineering Division, American Society of Mechanical Engineers, meets June 23 at the Hotel Statler in Boston.

The textile engineers will gather as part of the parent society's Diamond Jubilee Celebration in Boston, June 20-24. The theme for the ASME function is: "The Engineer in the World of Science."

L A Runton, chief engineer for Alexander Smith, Inc, heads the Textile Engineering Division.

The full program for the meeting follows:

"Crimping Filament Yarn by the Ban-Lon Process", Leo W Rainard, Joseph Bancroft & Sons

"Taslan Textured Yarns", Fred C Fields, Jr, E I du Pont de Nemours & Co, Inc

"The Engineer's Role in a Competitive Textile Market", Stephen S Marks, Fairchild Publishing Co

"Engineering Aspects of Textile Structures", Kenneth R Fox, Fabric Research Laboratories, Inc

Mr Marks will serve as luncheon speaker and Mr Runton will be toastmaster.

Chairman for the session on bulk yarns will be Harold W Ball, Foster Machine Co, and vice chairman will be J F Matthews, M T Stevens & Sons.

Chairman for the afternoon session, at which Dr Fox will speak, will be Nathaniel M Mitchell of Barnes Textile Associates, Inc. Vice-chairman for that portion of the meeting will be Robert M Jones, Saco-Lowell Shops.

• Cyanamid Announces Special Facilities to Meet Medium-Scale Demand

The installation of special facilities which can produce a wide range of chemical compounds and embody numerous different processes, has been announced by Kenneth C Towe, president of American Cyanamid Company.

"These highly versatile facilities", Mr Towe said, "are designed to help solve some of the most difficult problems in the chemical industry. They will assure our customers of a dependable source of larger-than-usual quantities of new chemicals which have not yet become commercial, and provide a means for evaluating such products in terms of their long-range commercial possibilities. They will shorten the time required to bring a product from the research laboratory into profitable commercial production; will permit important economies in introducing new products to industry; and will minimize the risk which management takes when it decides on plant additions to produce new products".

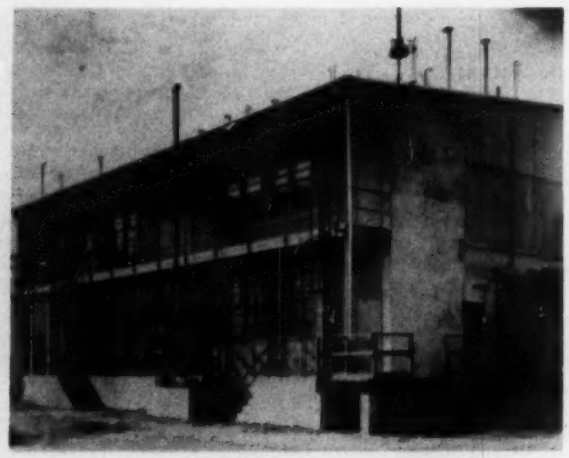
"Normally", Mr Towe explained, "when a chemical is born in the research laboratory, and a process for making it is developed, limited quantities are manufactured in a small pilot plant and sent to potential customers for evaluation. Then, as possible end-uses for the product are developed, the demand increases, overloading the pilot plant facilities, but not quite justifying construction of a commercial plant.

"The new facilities will produce quantities sufficiently large to meet this medium-scale demand, thus enabling other industrial companies to proceed with their own development programs with assurance of adequate supplies. Meanwhile, the production experience gained from this operation will permit Cyanamid to respond more quickly to large-scale demands calling for construction of commercial plants.

"Availability of facilities to produce new products for trial use in relatively large quantities has two other advantages, both of which reduce the risk faced by management in deciding on plant ex-

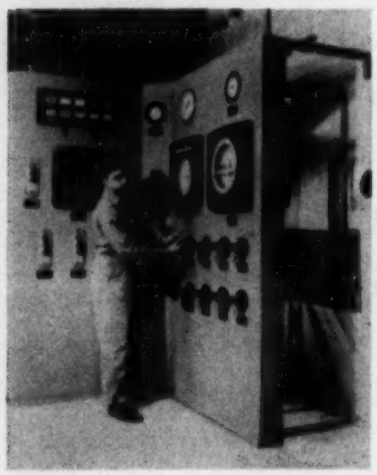
A look at some of Cyanamid's newer facilities——

BOUND BROOK:——

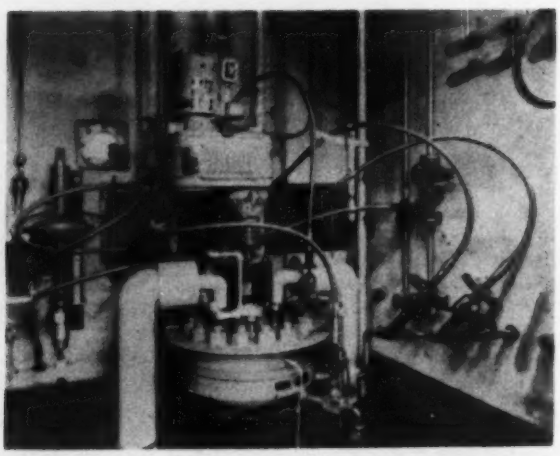


Exterior of high-pressure part of the plant.

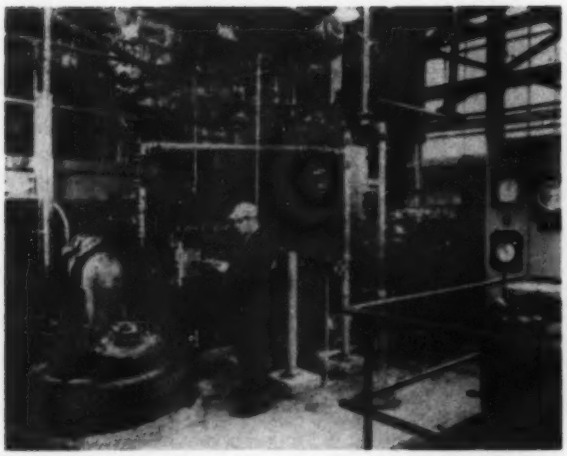
Part of the ammonia recovery system.



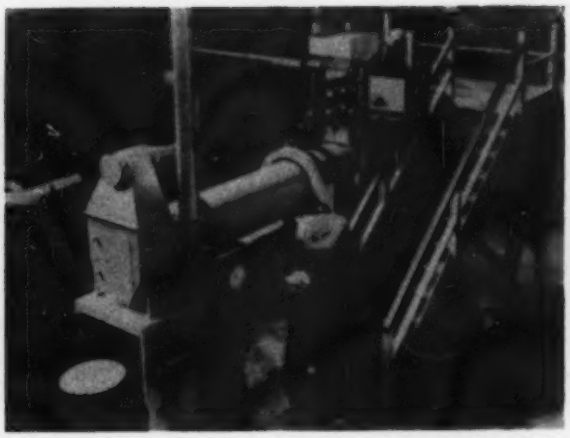
The entire Bound Brook installation is controlled at this panel. When trouble occurs, light panel (over operator's head) pinpoints location.



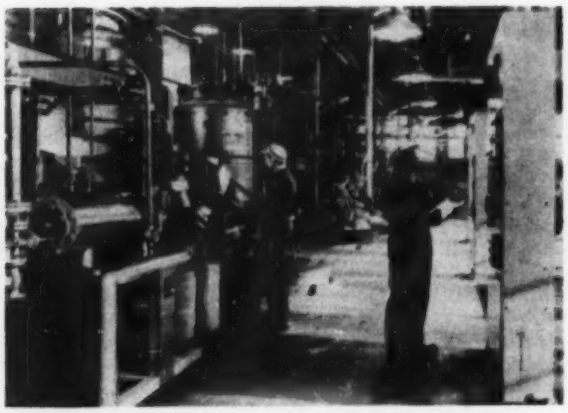
Heart of the installation is this unit which operates up to 2,000 psi. Cables lead from central control panel to valves.



Test run being conducted on recently installed glass-lined unit, in which glass pipes are extensively used.



Rotary drier that may be used when end product is a solid.



General view of crystallization, liquid handling and reaction area. All equipment is stainless steel or glass lined.

A drum drier on which a recently developed product goes through final processing.

pansion. On the one hand, a sounder appraisal of market potentialities is possible with relatively prolonged, medium-quantity output and, on the other, many technical problems faced in large-scale commercial production (which may not be revealed in pilot-scale output) are brought to light".

The facilities are divided between Cyanamid's plants at Bound Brook and Warners, New Jersey. The Warners installation includes general manufacturing facilities and at Bound Brook is located equipment for hydrogenation and other high-pressure reactions.

Ready for production in the new facilities are more than twenty derivatives of acrylonitrile, which Cyanamid pioneered in this country. Acrylonitrile is being manufactured in Cyanamid's new plant at Fortier, Louisiana, along with a number of other new products.

• Silicones Production Underway in France

Societe Rhone-Poulenc has started commercial production of a complete line of silicones in its recently-completed plant at St Fons, near Lyon, France. The $3,000,000 plant, built on a 10-acre site, is said to include the most up-to-date facilities for research and production on a large scale.

Societe Rhone-Poulenc was the first company in France to undertake production of silicones, to meet the growing European demand. It initiated research on silicones in 1942 and was successful in continuing development work on a seretive basis during the German occupation. Following years of pilot plant production, construction of the new plant, known as "Les Carriers", was started last summer.

• Hatch Anniversary

This year marks the 29th anniversary of Hatch Textile Research, Inc, 25 East 26th St, New York 10, N Y. The organization was founded in 1926, when interest in testing was largely confined to silk fabrics and hosiery. Today HTR offers a complete service in wearability and construction tests, including abrasion, colorfastness, shrinkage, crease resistance, water repellency, strength tests, tensile or breaking strength tests, moth resistance, fiber identification, content and composition, fabric and finish analyses, moisture determinations, etc.

A new price list, effective April 15th, shows no advance in prices over the last one issued December 1, 1954. The list may be obtained by writing direct to Hatch Textile Research, Inc.

• GAF Sales Up 20% in First Quarter

News of substantially increased earnings for the first quarter of 1955 and the election of two new directors marked the annual stockholders meeting of General Aniline & Film Corporation at 230 Park Avenue last month. John Hilldring, president of the Corporation, told the stockholders that preliminary estimates show sales of $28,791,000, an increase of nearly 20% over the same period last year, and profit after taxes of $787,000 compared with $244,000 for the first quarter of 1954.

The two new directors elected are General Lucius D Clay, who is chairman of the board of directors and chief executive officer of Continental Can Company, Inc, and Arthur E Pettit, a member of the law firm of Winthrop, Stimson, Putnam & Roberts, general counsel for General Aniline.

The increase in sales and profit in the Dyestuff and Chemical Division, Mr Hilldring said, reflected in part a comeback from a prolonged slump of several years duration in the textile market, principal outlet for GAF dyes. The upward trend, Mr Hilldring said, started in the latter part of 1954 and is presently continuing. An over-all increase of about 15% in volume for the Dyestuff and Chemical Division for the entire year is anticipated.

Mr Hilldring also told the stockholders of the progress in building operations for the Company's acetylene derivatives plant in Calvert City, Ky, and of a new chlorine-caustic plant at Linden, N J. The former plant reportedly will be the only facility in this country for the manufacture on a commercial scale of a large list of new acetylene products, including PVP (polyvinylpyrrolidone). Both plants are expected to be in operation by the end of this year.

• General Mills-Crosby Agreement

The Chemical Division of General Mills, Inc, and Crosby Chemicals, Inc, have announced an arrangement whereby General Mills will market the major portion of a complete line of tall oil fatty acids to be produced by Crosby Chemicals, under General Mills' Aliphat brand. General Mills' Chemical Division will continue to manufacture at Kankakee, Ill, tallow, soya, cottonseed, coconut, corn and other vegetable fatty acids.

Crosby has begun producing tall oil fatty acids at their plant at Picayune, Miss. Their new installation, with large capacity, is especially designed for tall-oil fractionation and distillation of fatty acids with extremely low rosin acids content.

The Chemical Division of General Mills will handle the distribution of the complete line of fatty acids, as well as fatty acid derivatives and polyamide resin through its district sales offices and sales representatives. General Mills will carry warehouse stocks throughout the country.

• Film by International Salt Co Wins Highest Award

International Salt Company, Inc, has been awarded the National Visual Presentation Association's first prize for the year's best slide film sales presentation with sound. The award was made at the Sales Executives Club luncheon in the grand ballroom, Hotel Roosevelt, New York, on April 12.

Entitled "Salt by International," the film, of half-hour length, depicts the production and refinement of salt and examples of its many thousands of uses in homes, farms and industry. It was produced by Depicto Films. In addition to distribution for business and industrial audiences, it will be made available for general educational purposes.

• IPR Completes Symposium on Fiber-Fabric Relationships

The Institute of Polymer Research at the Polytechnic Institute of Brooklyn has completed a highly successful series of conferences as part of a symposium on "Fundamental Fiber-Fabric Relationships", of which Jack J Press, U S Navy Clothing Supply Office and IPR, served as chairman.

The March 5th Conference on "Fiber-Yarn-Fabric Relationships" featured the following: "Comments", Milton Harris, Harris Research Laboratories; "Use of the Schlieren Technique to Observe the Still Air Layer above the Surface of Fabric Covering a Heated Flat Plate", C J Monego, QM Research and Development Command; "Laboratory and Service Evaluation of Textiles", Arthur G Scroggie, E I du Pont de Nemours & Co, Inc; "End-Use Requirements of Fabrics and their Relation to Fiber Properties", E C Pfeffer, Jr, Cluett, Peabody & Co, Inc; "The Finishing Touch", George L Baxter, Bradford Dyeing Assoc (USA); and "Factors Affecting Pleat Acceptance and Retention of Fabrics", John M Roughan, American Viscose Corp.

The April 2nd Conference, of which J B Goldberg, chemical engineering consultant, served as chairman, featured the following: "A Challenge to the Textile Industry", W W Heckert, E I du Pont de Nemours & Co, Inc; "Potentials for New Technical Developments with the Natural Fibers", George S Buck, Jr, National Cotton Council; and "Textile Developments—The Consumer's Verdict", Jules LeBarthe, Mellon Institute. A general discussion on "The Significance of New Fiber Developments" concluded the series with the following men serving as panelists: Thomas G Hawley, Jr, United Merchants Lab, Inc; Edgar L Schlesinger, Old Fort Finishing Co; and Messrs Heckert, Buck, Labarthe, and Press.

GENERAL CALENDAR OF COMING EVENTS

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Meeting of the Textile Subcommittee—June 30, Ocean House, Swampscott, Mass.

AMERICAN SOCIETY FOR TESTING MATERIALS

58th Annual Meeting—June 26-July 1, Chalfonte-Haddon Hall, Atlantic City, N J.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Meeting of the Textile Engineering Division—June 23, Hotel Statler, Boston, Mass.

CANADIAN ASSOCIATION OF TEXTILE COLOURISTS & CHEMISTS (Quebec Section)

June 18 (Annual Golf Tournament).

DEUTSCHE GESELLSCHAFT FUR CHEMISCHES APPARATEWESEN

Achema XI—May 14-22, Frankfurt am Main, Germany.

DRYSALTERS CLUB OF NEW ENGLAND

June 24 (Outing—Wachusett Country Club, W Boylston, Mass).

THE FIBER SOCIETY

Fall Meeting—Sept 8-9 1955, Massachusetts Institute of Technology, Cambridge, Mass.

INTERNATIONAL TEXTILE EXHIBITION

2nd Exhibition—June 25-July 10, 1955, Brussels, Belgium.

INTERNATIONAL WOOL TEXTILE RESEARCH CONFERENCE

September, 1955—Sydney, Melbourne, and Geelong, Australia.

NATIONAL COTTON COUNCIL OF AMERICA

1955 Chemical Finishing Conference—Sept 20-21, Chalfonte-Haddon Hall, Atlantic City, N J.

PURDUE INDUSTRIAL WASTE CONFERENCE

10th Conference—May 9-11, Purdue University, La ayette, Ind.

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION

May 11, Sept 14, Oct 11, Nov 9 (Hotel Commodore, New York, N Y); June 9-11 (Outing ——The Greenbrier, White Sulfur Springs, W Va).

TAPPI (Metropolitan District)

May 10 (Fraunces Tavern, New York).

• Eastman Introduces the Eastofix Dyes

As an answer to the problem of wash fastness which has existed heretofore in the piece-dyeing of acetate fabrics, the laboratories of Eastman Chemical Products, Inc, have come up with a new family of dyes and a new dyeing technique, which, it is reported, meet the specifications of AATCC's No. 3 wash test. In withstanding washing for 45 minutes at 160°F without noticeable fading or staining, the new family of colors display wash fastness equal or superior to that of dyes for other fibers.

The new dyes, known as the Eastofix colors, and the new technique—the Eastofix process—were announced to the trade press last month in New York along with an outline of Eastman's new Estrel program. Estrel, a registered trade-mark owned by Eastman Kodak Co, will designate a class of fabrics which contain a minimum of 50% of Estron yarn or fiber, the Estron portion of which is dyed with Eastofix dyes. In a blend, the non-acetate portion of the fabric must have fastness characteristics equal to those obtained on the Eastofix-dyed Estron portion of the fabric.

J E Magoffin, sales manager of Eastman's Chemicals Division, declared that Eastofix dyes are specially synthesized chemical compounds which have an affinity for acetate fabrics.

"They have built into the molecule chemical groups which make possible the insolubilizing of the dye by treatment with an insolubilizing or fixing agent", Dr Magoffin explained. "Once the dye has been made insoluble by chemical reaction with the fixing agent, it can be removed from the fabric only by chemical means—in our tests, the most drastic washing and boil-off treatments have little, if any, effect.

Eastofix dyes are properly applied in dye boxes or becks, as are many other acetate dyes. The new Eastman dyes do, however, require closer control.

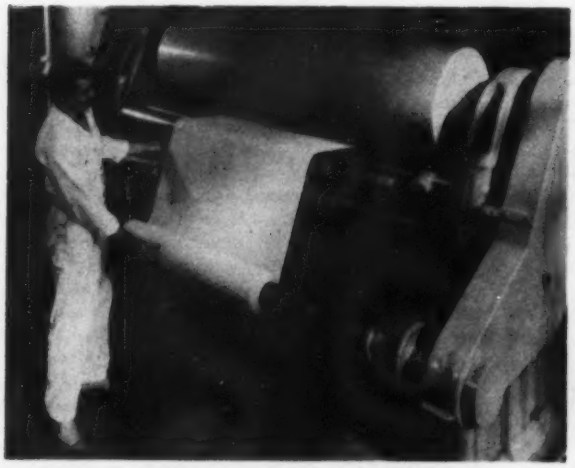
"Because of the chemistry of the fixing process, a special technique is required in the application of Eastofix dyes. While the dye itself is applied in an ordinary dye beck, a second step is necessary to carry out the fixing reaction. After dyeing, the cloth is rinsed and extracted, following which the fixing agent is padded on. After a short period of time for the fixing reaction to take place, the goods are washed and finished in the regular manner. At our present state of knowledge of this new dye chemistry, only piece goods can be dyed and these only in the dye beck. Package dyeing, raw stock dyeing and jig dyeing have not yet been worked out. Printing, however, is quite practical.

"While Eastofix dyes themselves are effective only on acetate, it is possible to dye mixed acetate-viscose fabrics and achieve wash fastness. To do so, particular care must be taken in the selection of the viscose colors so that a good union shade is obtained and the viscose colors are not adversely affected by the fixing process.

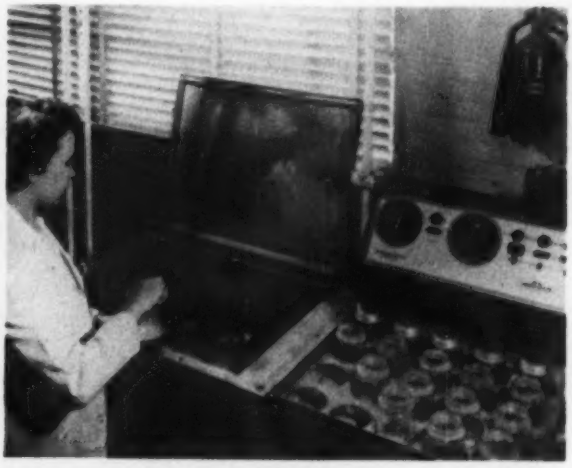
"It must be emphasized that Eastofix dyes are quality products, that the process of dyeing involves some extra cost and that, therefore, these dyes will not immediately become the backbone of acetate dyeing. We are in the early stages only of a new field of dye technique and technology. The number of colors available, as you can see, is limited. The application of the dyes requires careful supervision. All of these will be obstacles to rapid adoption. They are obstacles, however, that we know from past experience can be overcome with time and continued research endeavor. It is reasonable to expect that the premium for Eastofix dyed acetate fabrics will become smaller and smaller and that ultimately it may disappear.

"Eastofix dyes are also available as print pastes and seem particularly well adapted for application printing. The excellent gas, light and wash fastness that they possess indicates a real place for them in all acetate draperies, upholsteries and quality dresses.

"For piece goods dyeing the Eastofix colors show great promise for all-acetate linens, acetate-viscose shirtings, flannels



Eastofix dyes are set by the application of fixing salts, which are applied in a standard padder.



Eastofix dyes, when properly applied, reportedly pass the AATCC #3 wash test.

and gabardines."

Properly applied, the Eastofix dyes are said to exhibit excellent fastness to both atmospheric fumes and sunlight in addition to their outstanding wash fastness. Furthermore, the Eastofix dyes need no gas inhibitor, it is claimed.

In discussing the Estrel program, R L Churchill, Eastman vice president, stated, "The purpose of this program is to establish the word Estrel as a class name for all-acetate fabrics or acetate-rayon blends that will signify to the consumer outstanding qualities of wash fastness and washability. Fabrics made by any Eastman customer which meet the above definition will be eligible for participation in the program.

"To assist in the control problem involved in handling the variety of fabrics which will be treated in this promotion, we intend to use a fabric registration plan under which each participating customer submits an initial sample of the fabric meeting the above definitions and agrees in writing not to change the fiber content, construction, dyeing or finishing procedures from the approved sample without first notifying us. This eliminates the necessity for repeated tests as the fabric is used for garments by various manufacturers and enables us to offer promotional assistance to an approved fabric based on fabric style numbers of a given customer. I would like to point out that our company does not plan to embark on a complicated quality control program but we do intend to apply the Estrel mark only to those fabrics which meet the definitions above outlined and which our customers and ourselves are confident will give full consumer satisfaction."

• Neopone LO

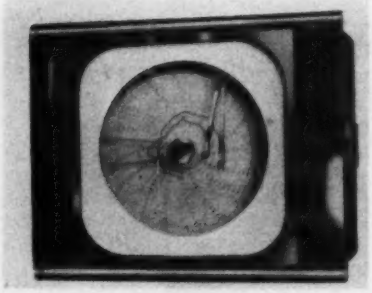
Neopone LO, a new low-sudsing nonionic detergent in spray dried bead form, designed for automatic laundry machines, has been announced by Ultra Chemical Works, Inc, 2 Wood St, Paterson, N J.

Especially formulated to wash cotton clothes cleaner, Neopone LO is said to represent a marked improvement over early forms of nonionic detergents built for laundry purposes. It is also reported to be effective on rayon, nylon, and blended synthetic fibers.

The manufacturer points out that its white color, pleasant odor, and free flowing qualities make Neopone LO attractive to the user.

Neopone LO is packed in 50-lb bags and 130-lb drums. Stocks are carried in Charlotte, Atlanta, Chicago, and at Ultra's plants in Joliet, Ill and Los Angeles.

Samples and data sheets will be sent by Ultra upon request.



Bristol Two-Pen Round Chart Dynamaster Recorder

• Dynamaster Recorder Makes Two Records Simultaneously

A new round-chart electronic Dynamaster potentiometer recorder that can make two continuous records at the same time on a 12-inch round chart, has been announced by The Bristol Company, Waterbury 20, Conn.

In many applications, records of two related measurements must be closely compared with respect to the magnitude and time of any variations from the desired value.

The Dynamaster potentiometer and bridge instruments can be used to measure and control any variable which can be translated into an electrical quantity, such as temperature, pH, consistency, speed, pressure, weight, and others.

• National Alizarol Verdon S; National Black K Salt

National Aniline Div, Allied Chemical & Dye Corp, 40 Rector St, New York 6, N Y, has added to its line National Black K Salt, a stabilized diazonium salt, and National Alizarol Verdon S, a nondusting chrome dye.

National Black K Salt produces, on cotton and viscose rayon, jet black shades when combined with National Naphthols AS-BG, AS-BS and AS-SW; while reddish black shades are obtained when coupled with most of the other National Naphthols. National Aniline points out that most of these colors possess very good to excellent fastness to light, washing, soda boil, hot pressing and other wet processing. This product may be applied on the continuous padding range, in pressure package machines, and in open tubs. It is suitable for application by the various printing processes and it is reported that many of the combinations may be discharged to good whites with hydrosulfite discharge pastes. The manufacturer suggests the product's suitability for sport and work clothes, children's play clothes, prints and materials to be rubberized.

National Alizarol Verdon S is applicable to wool by the top-, meta- and bottom-chrome methods of dyeing. It produces subdued bluish-green shades, with the top-chrome method yielding the brightest shades. It reportedly exhibits good light fastness in medium and heavy shades; very good fastness to cross-dyeing, fulling, crabbing and shrinkproofing; and excellent fastness to other wet processing including carbonizing. It is suitable for coloring materials that are to be resin finished for crease resistance. This product is more adaptable for raw stock and slub work than for piece goods because of its fast drawing properties. National Aniline suggests its suitability for coloring carpet yarns and knitting yarns for sweaters and bathing suits.

• Economical Load-Measuring Elements

A series of redesigned and highly sensitive volumetric load-measuring elements capable of a wide range of application has been introduced by Taylor Instrument Companies. Described as rugged, dependable, and economical, the units directly measure tension, compression, or force, and reportedly indicate or record all measurements up to a maximum distance of 200 feet. Accuracy of the units, which is said to average 99 percent, reportedly is unaffected by friction or hysteresis in the loading system.

Since the newly designed elements do not come into contact with the material being weighed, they are of special interest to industries faced with the problem of weighing corrosive liquids or heavy solids.

Four types of element are provided — spool, ring, diaphragm, and capsular. The spool type element is used on applications where loads are especially heavy and in need of constant checking — for example, on tank cars. Ranges are up to 250,000 pounds for compression loads and up to 30,000 pounds for tension loads. The element may be used on both horizontal and vertical tanks.

The ring type element has a range up to 25,000 pounds, compression only. It is recommended by the manufacturer for use on stock-beaters and similar applications. A hole through the center of the unit clears the load screw or shaft.

The diaphragm type element is used for measuring squeeze-roll pressure up to 6,250 pounds. By permitting uniform application of load across the rolls, it is said to contribute greatly to uniformity of drying and finish, while assuring long-term satisfaction.

The capsular type element, with a range up to 300 pounds and adjustable to a minimum span of 30 pounds, can be used to measure film tension within close limits as an indication of "gain" or percentage of stretch. It is used in conjunction with the Transaire pressure transmitter.

For more detailed information write Taylor Instrument Companies, Rochester 1, New York, and ask for Bulletin 98232.

NAMES IN THE NEWS

Cobb

Arnold

Herbertson

Bruns

Reed

Roberts

Following the annual meeting held at the firm's Providence offices on April 20th, it was announced that W CHESTER COBB, commercial vice president, had been elected president of Arnold, Hoffman & Co, Inc. Mr Cobb succeeds EDWIN H ARNOLD, who had held the post of president since 1937. Mr Arnold will become chairman of the board of directors.

ERIC R HERBERTSON was named to succeed Mr Cobb as commercial vice president.

HARRY G BRUNS, formerly treasurer, was named financial vice president and FIRMIN REED, formerly director of research, was elected technical vice president.

It was further announced that, after 33 years with the firm, THOMAS H ROBERTS, technical vice president, is retiring.

GEORGE W EWALD, formerly of the Development Department of Celanese Corporation of America, recently was named manager of the newly created industrial sales department of the Textile Division of the company. At the same time A S DEMPEWOLFF, previously manager of the market development department, was named assistant to K C LOUGHLIN, vice president and general manager of the division.

While the market development department is being replaced, it was emphasized that its activities will be continued as a function of the industrial sales department. The new department is also engaging in special product development work in the nonwoven fabric field.

WM HOWLETT GARDNER, previously with the New Products Division, National Aniline Division, Allied Chemical & Dye Corporation, New York, is now attached to the Chemical Sales Department of that company. In this new position, Dr Gardner will be responsible for the preparation of technical literature on National's new chemicals. Additionally, he will act as a technical representative in the sale and application of National Aniline chemicals.

HOWARD S BUNN has been elected executive vice-president and member of Executive Committee of Union Carbide and Carbon Corporation.

Mr Bunn has been a member of the Union Carbide organization since 1922. In April, 1953, he was elected a vice-president and in September, 1954, a director of Union Carbide.

T R MILLER has been appointed director of the South Charleston Plant Laboratories of Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation.

Dr Miller joined the Company in 1940.

LAWRENCE H FLETT, consultant, was elected president of the American Section of the Societe de Chimie Industrielle at a general meeting held at the Savoy-Plaza Hotel in New York on April 14th. In addition to Mr Flett, the new officers of the American Section are:—

Vice presidents — ROBERT S ARIES, consultant, and JEAN R L MARTIN, Coty Products Corp;

Vice president (Canada) — JEAN KERN, National Aniline Div, Allied Chemical Corp;

Secretary-treasurer — PIERRE BOUILLETTE, Givaudan Corp;

Honorary secretary — JEROME ALEXANDER, consultant.

The new officers were also elected directors. Other directors are:

PROSPER CHOLET, General Chemical Div, Allied Chemical Corp;

EMIL OTT (past president), Hercules Powder Co;

WORTH WADE (past president), American Viscose Co.

THOMAS F CLEARY, formerly vice-president and director of research for Chemagro Corp, New York, has joined Philip J Lo Bue Co, New York, as sales manager for fine organic intermediates. Mr Cleary will supervise sales of the products sold by Lo Bue under its newly-acquired agency for Crestwood Chemical Company, Chicago, Ill.

R A BRISTOL, director in charge of over-all sales activities of The Foxboro Company, Foxboro, Mass, has announced the appointment of C C FULLER as vice president, augmenting the sales management staff, H O EHRISMAN as general sales manager, and J J BURNETT as field sales manager. C SCHWARZLER will continue to direct Foxboro's expanding international operations. Vice president C E SULLIVAN, who has retired from active sales direction, will serve in a consulting capacity with the sales organization.

Also announced was the formation of a sales product development committee headed by Mr Fuller and a sales policy committee with Mr Ehrisman as chairman, further coordinating the company's sales engineering and manufacturing functions.

Fuller

Ehrisman

Sullivan

TECHNICAL LITERATURE

(It is understood that the following literature is available from the sources listed in italics).

A REVIEW OF THE AIR FORCE MATERIALS RESEARCH AND DEVELOPMENT PROGRAM, PB 111537———*OTS, U S Dept of Commerce, Washington 25, D C;* $3.75———Ten years of expanding research and development aimed primarily towards the development of "supersonic" and high-performance materials is surveyed in this Air Force publication.

This review of work sponsored in the field of materials and processes contains abstracts of Wright Air Development Center technical reports from July 1, 1951 to June 30, 1953 in the areas of textiles, metallurgy, petroleum products, structural materials, rubbers, plastics, packaging, protective treatments, and analysis and measurements. Eighty-two of the volume's 143 pages are devoted to these abstracts. Reports prior to July 1, 1951 are grouped under study areas and listed by title, investigator and date.

AMINOETHYL ETHANOLAMINE ——— *Carbide and Carbon Chemicals Co, 30 East 42nd St, New York 17, N Y*———Bulletin F-6455 contains information on properties, specifications, shipping container contents, safe handling practices, applications, and selected references.

This reactive chemical is used in the production of textile assistants, sequestering agents, and insecticides. It is of particular interest as a raw material for cationic surface-active agents—4 pages.

ANTARA CATALOGUE OF PRODUCTS———*Antara Chemicals, 435 Hudson St, New York 14, N Y*———In addition to listing established items, this second edition describes the many new chemicals that have been developed by Antara since the first catalogue was published.

A new section has been added to the second catalogue, listing the items handled by Antara's Special Product Sales Department. They are shown under their chemical abstract as well as their common names. In this section there is also a description of the various available grades of Carbonyl Iron Powder.

AUTOMATION DICTIONARY
PNEUMATIC CONTROL AND TRANSMISSION SYSTEMS (BULLETIN 1120)
ELECTRIC INDUSTRIAL MOTORIZED VALVE ASSEMBLIES (BULLETIN 8506)
TEL-O-SET AUTOMATIC RATIO RELAY (BULLETIN 8410)
CAM PROGRAMMER THERMOMETERS (SPEC SHEET 602)
COMPOSITE CATALOG (CAT 5002)

W A Lang, Product Editor, Industrial Division, Minneapolis-Honeywell Regulator Co, Wayne and Windrim Aves, Philadelphia 44, Pa.

AUTOMATION DICTIONARY———This small dictionary translates some 87 words and phrases from "engineeringese" to layman-like definitions as an aid to "those whose knowledge of automatic control is largely limited to the setting of a thermostat of the living-room wall."

PNEUMATIC CONTROL AND TRANSMISSION SYSTEMS ——— Bulletin 1120 describes pneumatic controllers, their applications and how they work. It also describes pneumatic transmission systems and cascade, ratio and other interconnected control systems, as well as practical information for plant operators on how to tune pneumatic controllers to a process, how to introduce manual adjustments and how to provide the best air supply.

ELECTRIC INDUSTRIAL MOTORIZED VALVE ASSEMBLIES———Bulletin 8506 gives all information required for the selection of Honeywell valve bodies, linkages, and power units, along with references to other sources of data on the subject.

TEL-O-SET AUTOMATIC RATIO RELAY——— Bulletin 8410 describes an automatic ratio relay which receives pneumatic input signals from two sources and transmits an output signal which is proportional to one of the inputs, with the degree or proportionately determined by the second input signal. This relay is useful in ratio control, cascade control, pneumatic computing systems, and other applications in automatic control and computing.

CAM PROGRAMMER THERMOMETERS——— Specification Sheet 602 describes internal cam programmer thermometers which are designed to maintain a definite relationship between temperature and time.

COMPOSITE CATALOG———Catalog 5002 is a new issue of the composite catalog which briefly and concisely describes Honeywell industrial instruments and equipment, including the latest developments.

BRISTOL CONTINUOUS pH RECORDERS & AUTOMATIC CONTROLLERS BRING LABORATORY ACCURACY INTO THE INDUSTRIAL PLANT———*The Bristol Co, Waterbury 20, Conn*———Illustrated with 100 photos and detail line drawings, the 38-page bulletin Q1304 discusses complete instrumentation for pH measurement and automatic control.

It contains drawings and photos of installations of pH recording and controlling instruments in such processes as coagulation at the optimum pH, recarbonation, pH changes during water conditioning, pH during aeration in the activated sludge process, and pH in the acid phase of the digestion process, as well as general applications in the textile and other industries.

The bulletin features complete pH systems, including the electrode assemblies, amplifier, and Electronic Dynamaster round- or strip-chart recorders and controllers in both pneumatic or electric control actions. The new Beckman Model W Amplifier is illustrated and detailed for the first time in conjunction with a pH recording system.

Accessories shown in the bulletin include: electrodes and assemblies, manual and automatic multiple switching stations for recording pH measurements from more than one point with a single Multiple-record Dynamaster; connector boxes for use where it is necessary to offset the amplifier more than ten feet from the electrodes; and a complete line of final control elements for adding liquid, solid, slurried, and gaseous reagents to the process.

DYEHOUSE AND LABORATORY SUPPLIES———*Reading Scientific Co, Reading, Pa*———This 36-page catalog covers Reading Scientific Co's complete line of dyehouse and laboratory supplies with illustrations, descriptive material, and prices. The line includes stainless steel ware, scales and balances, acid pumps, pH meters, rubber gloves, water baths, mixers and agitators, thermometers, beakers, graduates, hydrometers, and pipettes.

ENGINEERING MATERIALS FOR MODERN INDUSTRY———*National Vulcanized Fibre Co, 1055 Beech St, Wilmington 99, Del*———This 16-page, 2-color bulletin covers the properties, grades and uses of National vulcanized fiber and Phenolite laminated plastic.

Case studies illustrated by more than 45 photographs match physical properties (impact resistance, dielectric strength, arc resistance, durability, light weight, flexibility, temperature and corrosion resistance, compressive and tensile strength) to typical uses (transformer coils, circuit breakers, rail joint insulation, gear blanks, athletic safety equipment, backing for abrasive discs, sample cases, chrome plating barrels, printed circuits) for both of these materials.

Tables list the general properties of the several grades of National vulcanized fiber (including commercial fiber, bone fiber, Pearless insulation) and the 40 grades of Phenolite Laminated plastic (including such base materials as paper, cotton fabric, asbestos, fiber glass and nylon fabric).

ITACONIC ACID———*Chas Pfizer & Co, Inc, Chemical Sales Div, 630 Flushing Ave, Brooklyn 6, N Y*———This 20-page, paper bound, index-type technical bulletin (No. 82) outlines the uses and properties of itaconic acid, a versatile organic compound made in commercial volume by fermentation. Its properties suggest its use as an intermediate in the preparation of dyestuffs and other complex organic compounds.

Charts, molecular structure, reactions, polymerization, patents and packaging and shipping data are included.

MODEL 41A PNEUMATIC INDICATING CONTROLLER———*The Foxboro Co, Foxboro, Mass*———Bulletin 5A-13 describes in detail the company's new Model 41A Pneumatic Indicating Controller, which replaces the earlier Model 41 for control of process variables, such as temperature, pressure, liquid level and humidity.

New design features are fully explained, with emphasis on the longer, more readable indicating scale, extensive use of high quality control components, and simplified maintenance.

In addition to on-off control, the new instrument provides proportioning action adjustable from ¼ of 1% to 25% of scale range, extending its field of industrial process application. The new proportioning mechanism is diagrammed and explained; typical applications are shown.

Separate sections are devoted to temperature and pressure measuring systems, with information on the filled thermal system available, temperature bulbs and accessories, new pressure elements, pressure seals and control valves.

Complete controller specifications are also presented—12 pages.

PRINCIPLES OF EMULSION TECHNOLOGY———*Colgate-Palmolive Co, 105 Hudson St, Jersey City 2, N J*———Practical industrial problems of emulsion are the subject of a new pocket-sized book by Dr Paul Becher, senior chemist of the Colgate-Palmolive Company.

The book includes concise explanations of the chemistry of dispersions and emulsions, emulsifying agents, surface activity, and demulsification. Methods of testing emulsion properties are covered in detail, and there are illustrations and descriptions of equipment.

RIGID PLASTIC FABRICATIONS AND PIPE———*The Atlas Mineral Products Co, Mertztown, Pa*———This 8-page bulletin outlines the use of Type I polyvinyl chloride in the fabrication of exhaust systems process equipment, and processing tanks. Resistance characteristics and physical properties of the plastic are included in the section.

Also included is a section on plastic pipe and fittings. Descriptions and tables on chemical and physical properties of Type I and II polyvinyl chloride and styrene copolymer rubber resin blend plastic pipe are included.

ROLL-SURFACE FINISHES———*Rodney Hunt Machine Co, Dept IR, Orange, Mass*———Rodney Hunt's latest Industrial Roll Engineering Report (No. 6) is designed to be a help in finding the right roll finish for the right job.

The illustrated report discusses the various types of precise instruments used to measure surface roughness such as profilometers and visual scales. It also discusses lathe finishing, deburring, polishing, grinding and ways to correct rough surface finishes on rolls used for specific purposes. A chart is included which will assist selection of proper roll surface finishes for various types of usage. The chart, among other contents, lists average units of time required to attain various degrees of surface finish on steel rolls.

THE CHLOROMETHANES———*Advertising & Sales Promotion Dept, Solvay Process Div, Allied Chemical & Dye Corp, 61 Broadway, New York 6, N Y*———Data on the diverse uses and the physical and chemical properties of the chloromethanes—methylene chloride, methyl chloride, chloroform and carbon tetrachloride—are contained in the new, comprehensive 28-page booklet.

In addition to data applying generally to the chloromethanes, the book contains individual sections that supply specific figures and information on each of the products. Included are such items as toxicity, azeotropic data, flammability, solubility, shipping, handling and storage.

THE FATTY ALKANOLAMIDES—EMCOL 5000 SERIES———*Emulsol Chemical Corp, 59 East Madison St, Chicago 3, Ill*———Technical Bulletin No. 4 describes the properties, uses, and many formulations for this broad series of products.

• PATENT DIGEST •

PAUL WENGRAF

NONFELTING WOOL——Chlorine Treatment Under Strictly Limited Conditions A,2,04

U S Pat 2,671,006 (Kroy Unshrinkable Wools——McLauchlin——March 2, 1954)

Many suggestions for melt- or shrink-proofing wool by active chlorine have been published. The inventor states that new research has been carried out towards improving the well-known chlorinating methods, which comprise either very short treatments with highly contrated solutions or long-time treatments with very dilute liquids. Neither method is said to be satisfactory.

Very good results reportedly are attained by a strictly controlled chlorination under conditions protected by the present patent. It is suggested that hypochlorite solutions containing 0.035 to 0.09% available chlorine at a pH of 2.2-3.5 be used at temperatures between 4-24°C. The contact time should be at least 30, but not more than 70 seconds. It is preferable to pass the wool through three separate tanks for 15 seconds each; the bath is acidified by strong inorganic (sulfuric or hydrochloric) acids. An acid-resistant wetting agent (eg, Nacconol NG, Cerfak N100 or Casolene Oil HS) should be added to the first bath.

References cited by the Patent Office include those covering various chlorinating processes for rendering wool shrink resistant, eg, U S Pat 2,466,695 (Harris Research Labs 1949) {cf *Am Dyestuff Reptr 38*, 522 (1949)}.

SHRINKPROOFING NYLON or DACRON——Stretching over Heated Drums G,2,04

Brit P 700,100 (Imperial Chemical Industries ——Michie, Wild——Nov 25, 1953)

The claims to this patent protect generally a method for controlling shrinkage of woven fabrics by passing them in stretched condition over heated drums; the goods are held by at least two sets of pins, which are fixed directly or by means of bands or rings on the drum's surface.

The device for carrying out this method (see Figure 1) consists of the heated drum (A), metal rings for fixing the pins (P), and metal brushes (C) which press the fabrics down and cause the pins to pierce the selvedges.

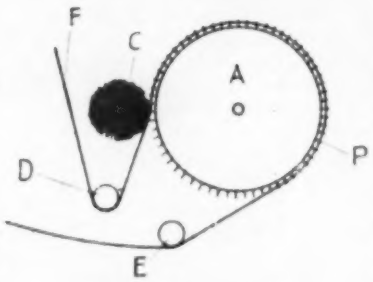


Figure 1—BP 700,100

While the means for pinning the edges as illustrated may be standard for tenter frames operating with needles, it is apparent that the process and the device are especially intended for heat-treating and setting nylon, Dacron or other synthetic materials, and also for goods which have been padded previously in a dyeing solution. It is reported that shrinkage of these textiles is avoided or at least minimized with this arrangement.

Example: A plain-weave cloth made from polyethylene terephthalate (Dacron) padded in a suspension of 30% Durindone Printing Red BS (CI #1207), 2.5% ammonium polymethacrylate and 0.8% of sulfonated oleic acid shows a pick-up of 20% liquid after leaving the padding mangle. After drying the cloth is passed over a drum, as shown in Figure 1, heated to 240°C and maintained during passage at 235-245°C. The cloth is dyed a bright scarlet; it does not require any separate setting aftertreatment.

The dyeing method disclosed in this example calls for applying vat-dyestuff-pigment suspensions carried in nonreduced state to the fibers and fixed by an overheating operation. The same company's Brit P 700,171 {cf *Am Dyestuff Rptr 44*, No. 1, 32 (1955)} suggests the application of vat-pigment-dye suspensions on Dacron, followed by a *pressure after-treatment*.

VAT-DYEING NYLON, CELLULOSE ACETATE OR ANIMAL FIBERS——Reduction with Thiourea Dioxide C,4,07

Brit P 702,040-1 (Hardman & Holden Ltd——Krug——Jan 16, 1954)
Brit P 702,056 (Hardman & Holden Ltd——Krug——Jan 16, 1954)
Brit P 702,075 (Hardman & Holden Ltd——Krug——Jan 16, 1954)

These four patents have in common a method for reducing vat dyes of the indigo, thioindigo or naphthalene quinone class by applying thiourea dioxide instead of the customary reducing agents, such as hydrosulfite or sodium sulfoxylate formaldehyde. The vats are used preferably in the form of acid leucovats.

Brit P 702,040 states that the water-insoluble or sparingly soluble acid leucovats that are prepared by acidifying normal alkaline vat solutions in the presence of a dispersing agent and/or a protective colloid have affinity for wool, silk or nylon. Greater stability of these dispersions is attained by using thiourea dioxide as a reducing agent. The manufacture of this compound is described in Du Pont's USPat 2,150,921 (see references below). It has been observed that an excess of the acid-stable thiourea dioxide is advantageous, in that it further improves the stability of said dispersions. The same is true in printing fabrics made of the aforementioned fibers with pastes containing an acid leucovat dye reduced with thiourea dioxide and an excess of this reagent. The addition of solvents to the vat preparation, eg, Glydote B (described as diacetone alcohol) or polyethylene glycol of mol weight 200, is suggested.

Example: 10g Ciba Brown G (micropaste) is vatted with 3g thiourea dioxide, 11g NaOH 30%, 10g Glydote B and 30 ml water. The alkaline liquid is poured into a British Gum suspension which is acidified with acetic acid and which contains moreover a dispersing agent such as Dispersol AS. A dried, previously shrink-proofed wool taffeta fabric is padded in this dyebath, dried and aged at 99-100°C for 4 min, then reoxidized with ammoniacal hydrogen peroxide.

Brit P 702,041, in contrast to the preceding method, calls for the use of alkaline vats reduced with thiourea dioxide and followed by acidification. It discloses that vat dyes can also be reduced directly with thiourea dioxide *under acid and neutral conditions* at 100°C and upwards, for example, by passing the goods through a customary ager. The acid leucovats have no affinity for cellulosic fibers, but they can be used well for dyeing wool, silk or nylon.

Example: A solution of 10g Durindone Printing Blue 4BCS, 5g thiourea dioxide, 15g Glydote B, 4g Dispersol AC, 3g British Gum 1:1 and 63g water is padded on a wool taffeta fabric which has been rendered shrinkproof by dry chlorination; the pick-up is 100%. After drying and aging for 4 min at 99-100°C, rinsing, soaping and reoxidizing with ammoniacal hydrogen peroxide one may expect a deep blue of excellent fastness properties.

Brit P 702,056 refers especially to the dyeing and printing of acetate of cellulose with acid leucovats reduced with thiourea

dioxide. The inventor states that no satisfactory shades can be expected whatever the reducing agent, and it will always be necessary to add a swelling agent. It has been observed that the acid leucovat liquids which contain a swelling agent are rather unstable when hydrosulfite or Rongalite are employed, but according to the present invention the stability can be improved by using thiourea dioxide as a reducing compound. The process may be applied accordingly for the printing of cellulose acetate textiles.

Example: An all-cellulose-acetate fabric is printed with a paste made up of 110g Ciba Bordeaux 2RN Double Paste, 50g thiourea dioxide, 40g Glydote B, 60g polyethylene glycol (mol wt 200), 100g water and 600g British Gum thickener 1:1. The printing operation is followed by drying, aging for 8 minutes at 100°C, rinsing, soaping and reoxidizing as above. A bright Bordeaux pattern results.

Brit P 702,075 suggests that acid leucovat pastes prepared by alkaline reduction with thiourea dioxide and acidified may be used in dyeing or printing on acetate fibers, while Brit P 702,040 refers only to wool, silk and nylon.

Example: A vat paste, containing Caledone Jade Green XNS, thiourea dioxide, caustic soda and thickener, is acidified with acetic acid. The goods are printed, aged, soaped, and reoxidized, eg, with nitrate plus dilute sulfuric acid as the oxidizing agent. Swelling agents may be added. An excess of thiourea has a favorable stabilizing effect.

Brit P 702,040 refers to Glydote B as diacetone alcohol, while 702,056, possibly in error, refers to it as thio diethylene glycol. The latter product is known by the trade name Glycine A (General Dyestuff).

Thiourea dioxide, which is also known in its isomeric form as formamidine sulfinic acid ———$NH_2C(:NH)SOOH$, was first prepared by Barnett by treating thiourea in neutral or alkaline solution with hydrogen peroxide [cf *J Chem Soc 63* (1910)]. This reaction was checked and better results were obtained by adding a concentrated solution of hydrogen peroxide to a cooled thiourea solution (USPat 2,150,921 — Du Pont-Havas). Another patent (USPat 2,403,937—Du Pont) suggests the application of this product for shrinkproofing wool by reducing the disulfide linkages to sulfhydryl groups. After studying the reactions of this compound, Boeseken stated that it is a reducing agent even stronger than hydrosulfite under alkaline conditions, while the reducing power decreases under acid conditions [cf *Rec Trav Chim Pays Bas*, 1040-5 (1936)].

STATIC PREVENTION——Sulfonated Polystyrenes Precipitated by Higher Amines G,1

USPat 2,676,896 (Monsanto Chem Co——Cohen, Scott——April 27, 1954)

This patent covers a method which has as its objective the imparting of durable antistatic finishes to all kinds of natural or artificial fibers and particularly to synthetic textile materials such as nylon, vinyl polymer yarns, and so on. Many attempts have been made to render these effects resistant to washing and drycleaning.

It is claimed that this problem has been solved by impregnating the fibers, knitted or woven fabrics, etc, with insoluble compounds which are formed by the interaction of sulfonated polystyrenes with higher amines.

According to the Monsanto-Baer method (USPat 2,533,210—see references below), sulfonated polystyrenes can be prepared by dissolving polystyrene in a chlorinated organic solvent and reacting it with sulfur trioxide. The amines applied in this process should contain long carbon chains, preferably from 10-20 C atoms (lauryl amine, cetyl amine, tributylamine) and also alkylene polyamines.

The ingredients can be used in a one-bath process by forming dispersions of the amines or amine salts plus sulfonated polystyrenes. The concentration of dispersions of this type is limited to a maximum solid content of 3%; a two-bath process is preferred where higher concentrations are required. Either of two procedures may be followed: 1) the higher amines, solubilized by formic or acetic acid, may first be padded on the material, then precipitated (after drying) by a sulfonated polystyrene solution, or 2) the goods may be impregnated with sulfonated polystyrene, insolubilized after drying by a solution or suspension of the amine. Best results are said to be attained by applying from about 0.5-3% pbw of the water-insoluble salts of sulfonated polystyrene.

Example: A 1.5% aqueous solution of tetraethylene pentamine is slowly added to a 1.5% aqueous solution of a sulfonated polystyrene containing 1.2 sulfonic acid groups per styrene unit. This results in a colloidal solution containing about 3% of the water-insoluble salt. This solution is padded on a nylon fabric (pick-up of 100%). After drying at 180°F the fabric is found to be resistant to static accumulation. The effect persists after 3 washings at 100°F and withstands a drycleaning process well.

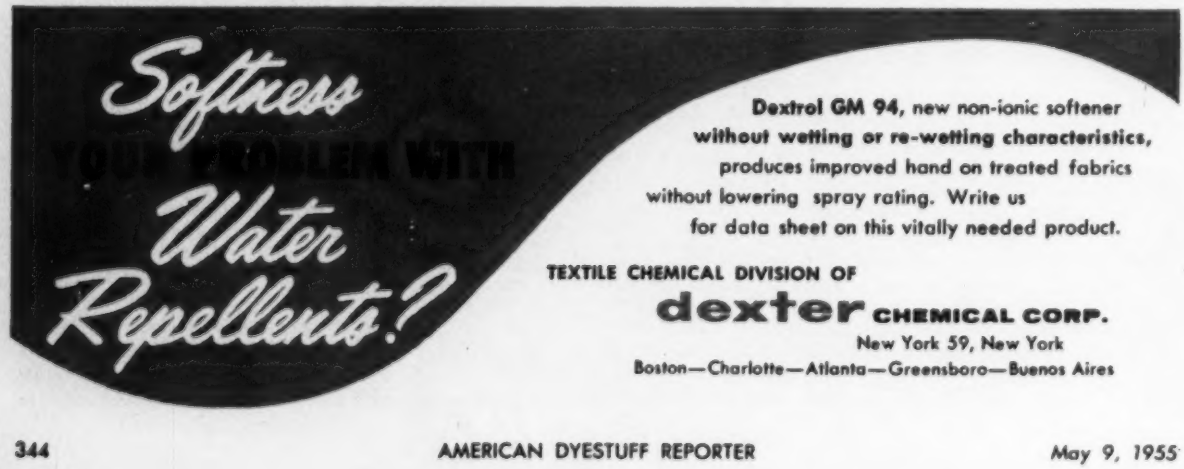
References cited by the Patent Office:

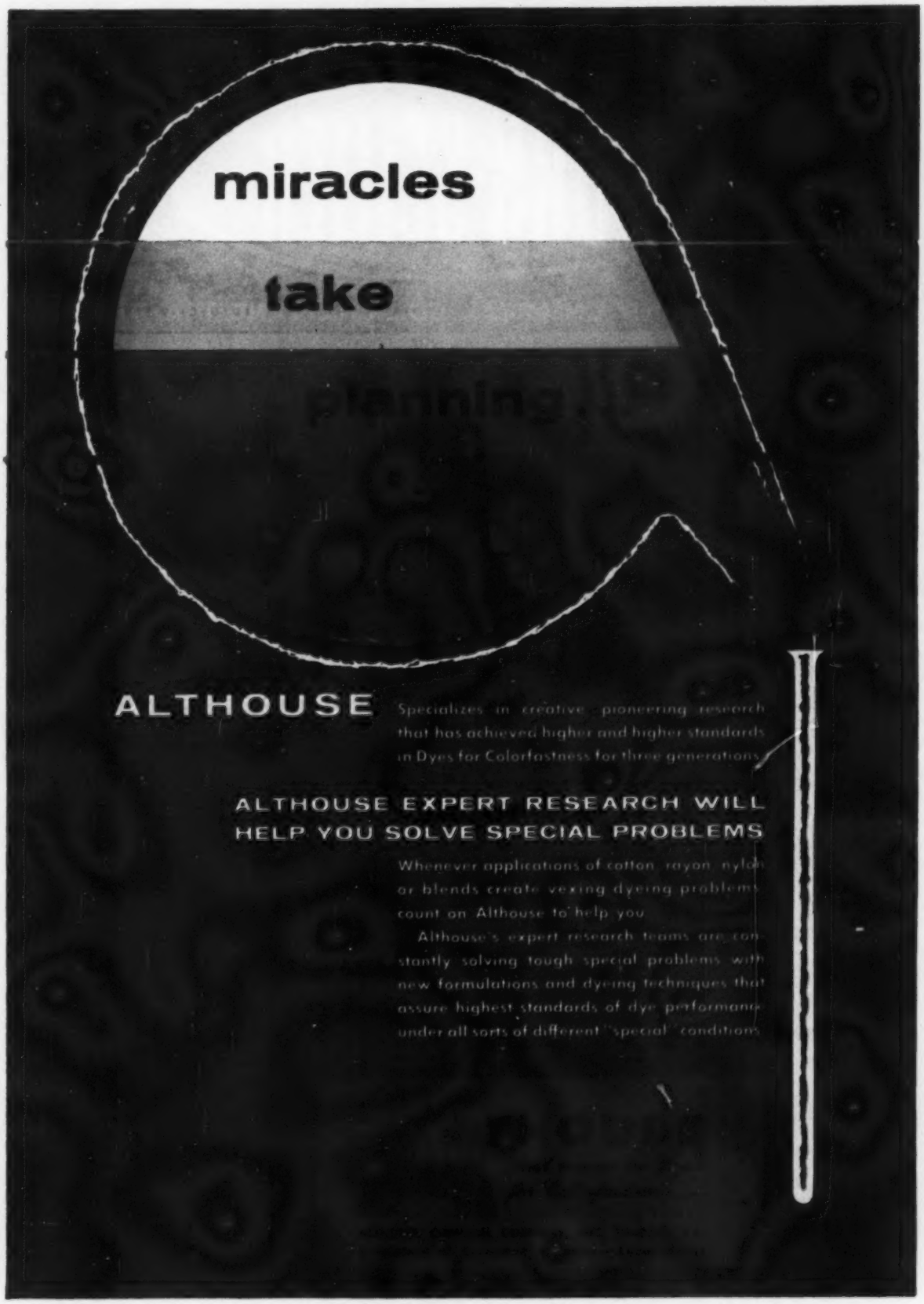
USPat 2,533,210 (Monsanto Chem Co / 1950): sulfonating polystyrene by dissolving the polymer in a halogeno-organic solvent at low tempertuares (−15 to + 5°C) and reacting it with a sulfur trioxide-chlorinated ethylether complex.

USPat 2,511,498 (Shell Development / 1950): impregnating fabrics with solutions of a sulfonated natural rubber compound, which is prepared by dissolving rubber in an organic solvent and passing sulfur dioxide through this solution [cf *Am Dyestuff Reptr 39*, 926 (1950)].

USPat 2,283,236 (Union Gas Improvement Co / 1942) describes a sulfonation product of polymer methyl styrene, designed especially for use in sizing cellulose acetate or cotton threads.

USPat 2,031,929 (I G Farben / 1936): impregnating porous materials by using water-soluble salts of sulfonated rubber or styrene polymers.




miracles
take
planning...
ALTHOUSE
Specializes in creative pioneering research that has achieved higher and higher standards in Dyes for Colorfastness for three generations.
ALTHOUSE EXPERT RESEARCH WILL HELP YOU SOLVE SPECIAL PROBLEMS
Whenever applications of cotton, rayon, nylon or blends create vexing dyeing problems count on Althouse to help you.
Althouse's expert research teams are constantly solving tough special problems with new formulations and dyeing techniques that assure highest standards of dye performance under all sorts of different "special" conditions.

PENETRANTS • DETERGENTS • SOFTENERS • REPELLENTS • FINISHES

BURK-SCHIER

BURKART-SCHIER CHEMICAL CO., CHATTANOOGA, TENN.

CLASSIFIED ADVERTISEMENTS

Advertisements in this section are restricted to HELP WANTED—POSITIONS WANTED—EQUIPMENT wanted or for sale. Rates, effective February 1, 1954: One-time, $10.00 per column inch; 3 consecutive times (same copy), $9.00 per column inch; 13 or more times, $8.00 per column inch; Position Wanted, $2.00 per column inch. Figure 38 average words per column inch. Publisher reserves the right to reject or discontinue any classified advertisement. Replies should be addressed: Box Number . . ., c/o American Dyestuff Reporter, 44 East 23rd Street, New York 10, N. Y.

ABSTRACTING SERVICE—Abstracting and digesting of foreign patents and periodicals. Literature review and special reports in dyestuff and cellulose chemistry. PAUL WENGRAF, 88-36 ELMHURST AVENUE, ELMHURST 73, NEW YORK.

TEXTILES APPLICATION ENGINEER

A nationally-known up-state New York chemical manufacturer requires an experienced Textiles Specialist for application development work in the field of textile finishing.

Requirements are a technical college degree or equivalent with a minimum of five years' experience in development work and customer contact. This is an excellent opportunity for an aggressive man and the salary is fully commensurate with position requirements.

Please reply, giving full details of experience, education, earnings and salary requirements.

Write Box No. 903.

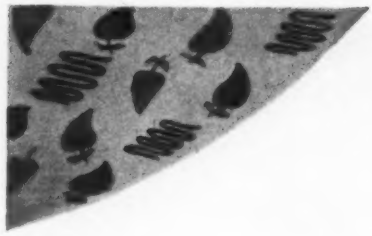
THE COMPANY: The largest management-owned manufacturer of textile chemicals in the United States. A thoroughly progressive organization with a policy of re-investing profits for expansion. Extensive and capable research, exceptionally fine service.
All applications will be held in strict confidence. Write Box No. 879.

WANTED: Ambitious chemical or textile chemical graduate with experience in cotton and rayon finishing; particularly with various types of resin finishing. The work consists of sales and demonstration with southern manufacturer or synthetic chemicals and textile resins. Excellent opportunity for advancement with a growing concern. Please give complete background. Write Box No. 895.

WANTED: Textile Chemist or Assistant Textile Chemist. Must be experienced in dye laboratory for dyestuff application and testing. Northern New Jersey. Write Box No. 888.

POSITION WANTED: TEXTILE CHEMIST AND COLORIST. Director of dyestuff application laboratory. Expert in standardizing, color matching and testing of all classes of dyes on all fibers, dyeing and printing. Considerable experience in technical sales and administrative work. Seeks responsible position. Will consider sales. Write Box No. 883.

POSITION WANTED: Quality and production control manager for commission dyeing plant or for multi-plant corporation. Experienced in all types blends and processing. Write Box No. 887.



DESIZING UNIFORMITY

TIME AFTER TIME WITH

RHOZYME LA*

RHOZYME LA is the most dependable desizing enzyme now available to the textile industry.

RHOZYME LA has consistent high quality, is stable in storage, and also exhibits unusual heat resistance in high-speed, high-temperature operations.

For the full story on this ~~low cost~~, highly efficient agent, write for our technical bulletin.

* **RHOZYME LA** *is another dependable chemical product for the textile industry made by the makers of* LYKOPON.

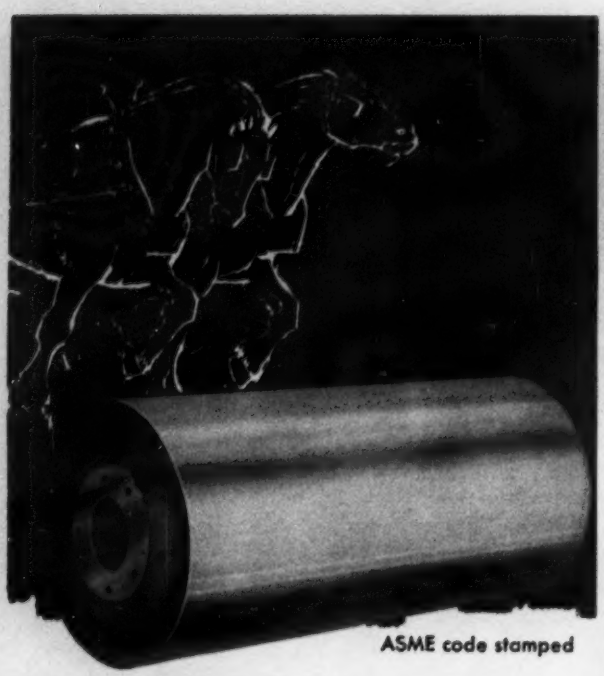
RHOZYME and LYKOPON are trade-marks, Reg. U.S. Pat. Off. and in principal foreign countries.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries



ASME code stamped

Fewer Horses do the job!

You wouldn't hitch two horses to a one-horse load, would you? Then why pull extra weight in old flat heads? Sims new Stainless Steel 75 psi reverse dished head Dry Cans are lighter . . . easier on the bearings . . . require far less horsepower. The new Sims Dry Cans give uniform transmission of heat and steam condensate is efficiently eliminated. Furnished Teflon-Coated if desired.

for ECONOMY and QUALITY

Our modern and progressive metal working shops, our skilled craftsmen, our know-how — these are guarantees of quality.

For custom tailoring of stainless steel, call, wire or write *now.*

Fabricators Since 1928

Sims METAL WORKS

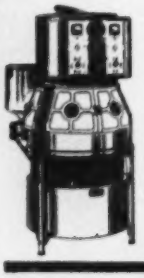
WEST POINT, GEORGIA

World Wide acceptance as the Standard machine for testing the action of sunlight on materials

Assures a quality of product that will more than meet conditions encountered in service.

ATLAS FADE-OMETERS

From 21 to 126 samples, depending on size, can be simultaneously exposed to the light of the Atlas Enclosed Carbon Arc. Exact duplicate tests can be repeated at any time. Temperature is controlled automatically and humidity is furnished by evaporation from a constant water reservoir. Operation of the Fade-Ometer is completely automatic, permitting the machine to be left in continuous 24-hour operation.



ATLAS ELECTRIC DEVICES COMPANY

4114 N. Ravenswood Ave., Chicago 13, Ill.

For over a quarter of a century makers of

WEATHER-OMETERS • FADE-OMETERS • LAUNDER-OMETERS

Classified Advertisements

POSITION WANTED: Print Supervisor-Colorist on dress goods, draperies, flannels, table cloths, corduroy, etc. Graduate chemist, fast color-matcher. Will consider steady 2nd shift position and willing to locate anywhere. Write Box No. 896.

POSITION WANTED: Dyer-Chemist, desires position with dyestuff, chemical or fiber firm. Extensive plant, laboratory, and managerial experience in box and jig synthetic plants. Textile college graduate. Write Box No. 897.

POSITION WANTED: Assistant Dyer-Laboratory Technician-Colorist. Technical background; supervisory experience; under 30. Interested in position which will enable fuller use of capabilities. Must be New York or New Jersey area. Write Box No. 898.

SALES REPRESENTATIVE: Century old national manufacturer has unusual opening for technical salesman. Industrial sales experience to greige mills and/or synthetic mills required. Eagerness and ability to sell essential. Technical knowledge of textile field useful. Travel required in North Carolina and South Carolina. Our employees have been informed of this advertisement. Write Box No. 899.

● Classified Advertisements ●

POSITION WANTED: Production Manager, Colorist, Supervisor, in textile screen printing or allied fields. Customer liaison and business experience. Cost conscious. Will relocate. Write Box No. 876.

POSITION WANTED: JIG DYER, 25 years' experience, directs, acetates, nylon and blends. South preferred. Write Box No. 884.

POSITION WANTED: Textile Chemist and Colorist for technical service. Extensive experience in all branches of textile processing. Thoroughly familiar with the detailed application of dyes, pigments, chemicals and finishes. Write Box No. 875.

WANTED: Chemist, Textile School graduate preferred. Must be experienced in lab and plant on synthetic piece goods for responsible position in New Jersey dyehouse. Write Box No. 885.

POSITION WANTED: Technical graduate with wide experience in supervising complete textile printing operations. Thoroughly familiar with modern methods and machines used in both roller and screen printing, dyeing and finishing. Write Box No. 872.

CHEMIST WANTED: With dyer's background. Preferably in narrow fabrics. One who is familiar with synthetics as well as natural fibers. Write in detail your background and salary desired. Reply will be held in strict confidence. Write Box No. 891.

FABRIC DEVELOPMENT SPECIALIST: Our client, a long established AAA1 progressive and expanding woolen mill near Boston making comprehensive line of coating and dress trade, plans creation of a new research and development division. Interested in top-notch aggressive man to develop new synthetic and woolen cloths incorporating newest ideas developed in the textile field. Knowledge of knitting helpful but not essential. This is an excellent opportunity to be associated with a leading mill offering a sound future. Attractive salary commensurate with ability for the right man. Richard Sales, John Hancock Building, Boston, Massachusetts.

CHEMICAL SPECIALTY SALESMAN: Man wanted to cover the South Carolina-Georgia area selling textile chemical specialities for a well established manufacturer. Compensation and expenses open to negotiation. All replies will be held strictly confidential. Write Box No. 892.

CHEMIST AND COLORIST for Philadelphia laboratory of a foremost Dyestuff Company. Employee benefits include vacations, life and hospitalization insurance and pension. Excellent opportunity for capable young man. Please give full details including salary expected and telephone number. Write Box No. 893.

WANTED: Jig Dyer on sulphur, vats, napthols. Steady position, small New York plant, complete charge. Good opportunity. Write Box. No. 894.

NOW A STABILIZER MAKING SODIUM CHLORITE BLEACHING EFFICIENT, SAFE, PROFITABLE

"DEPCO BLEACH ASSIST"

1. Controls the escape of toxic gasses. Makes it work in the bleach, not in the air.
2. Protection against corrosion under extreme low pH's.
3. Uniform bleaching assured through unique wetting properties.

Descriptive literature and samples on request. Ask for "100 and 101."

DE PAUL
Chemical Co.
44-27 PURVIS STREET
LONG ISLAND CITY 1, N. Y.

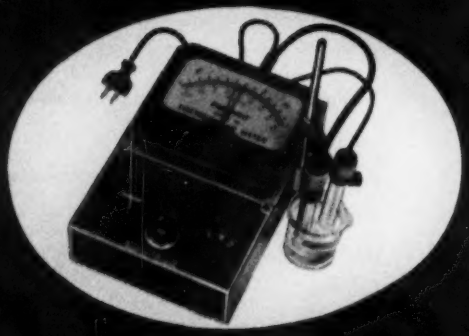
The House of Blacks

ACID BLACKS • DIRECT BLACKS
ACETATE BLACKS • LOGWOOD BLACKS
FORMALIDE BLACKS • DEVELOPED BLACKS

Consult your local dyestuff distributors for information and samples. Shipments can be made from their convenient stocks or from our Baltimore or Paterson warehouses.

YOUNG ANILINE WORKS, INC.
OFFICE AND FACTORY
2701-2733 Boston St., Baltimore 24, Md.

PHOTOVOLT
pH Meter MOD. 115



A full-fledged line-operated pH Meter of remarkable accuracy at the unprecedented price of **$115.-**

PHOTOVOLT CORP.
95 MADISON AVE NEW YORK 16 N Y

-DIASTAFOR-
TYPE L

ALL-PURPOSE
DE-SIZING AGENT

Standard Brands Incorporated
595 Madison Ave., New York 22, N. Y.

DIASTAFOR
A TRADE MARK OF STANDARD BRANDS INCORPORATED

HASTINGS LIGHT FAST VIOLET IRS—(C. I. 1073)

and

HASTINGS LIGHT FAST VIOLET 3RL

Excellent Level Dyeing Properties
Very Good Fastness to Light

Recommended for producing fast shades on Ladies' Dress Goods, Carpet Yarn and Upholstery Materials.

ZINSSER & COMPANY, Inc.
ESTABLISHED 1897
Manufacturing Chemists
HASTINGS-ON-HUDSON NEW YORK

59 Years of Research and Manufacturing Experience Assure Superior Quality and Service

Namico

SOAPS and DETERGENTS

SOAPS . . .
low, medium, high titer and built.

DETERGENTS . . .
anionic, nonionic, compounded.

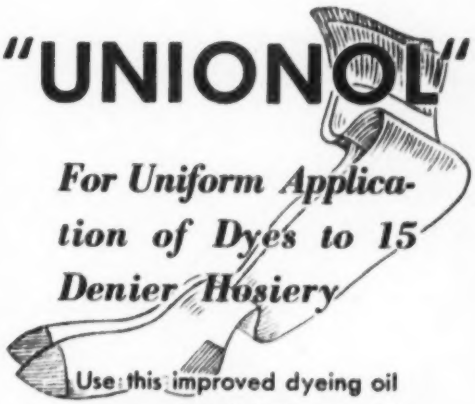
DYE RETARDANTS and PENETRANTS
for every wet processing need.

Technical literature and trained representatives available on request.

NATIONAL MILLING & CHEMICAL CO.
Industrial Soap Products Since 1896
4601 NIXON STREET, PHILADELPHIA 27, PA.

"UNIONOL"

For Uniform Application of Dyes to 15 Denier Hosiery



Use this improved dyeing oil to assure level dyeing—good unions—and to guard against costly rejects and redyeing.

LeaTex *"Always Reliable"*

LEATEX CHEMICAL COMPANY
2722 N. HANCOCK ST. PHILADELPHIA 33, PA.

what a finish!

VINREZ 202

the superior polyvinyl acetate emulsion

- **Extreme Clarity of Film**
- **Excellent Stability**
- **Compatible With All Types of Softeners and Starches**
- **Increased Resistance to Abrasion**

SEND FOR FREE TECHNICAL DATA

STEIN HALL

285 MADISON AVENUE — NEW YORK 17, N. Y.

ESTABLISHED 1866

Branch offices in 17 cities in the United States and Canada.

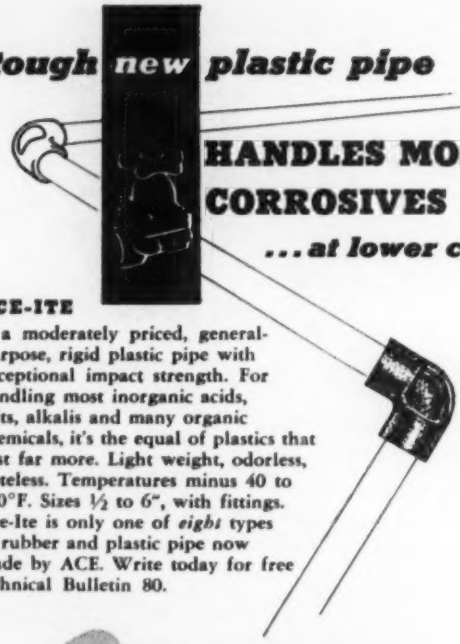
J. E. SIRRINE CO.

GREENVILLE • SOUTH CAROLINA

TEXTILE MILLS • RAYON PLANTS • KNITTING MILLS • FINISHING PLANTS • DYE HOUSES • BLEACHERIES • STEAM UTILIZATION • STEAM POWER-PLANTS • WATER • WASTE DISPOSAL • APPRAISALS • PLANS • REPORTS

---

tough new plastic pipe



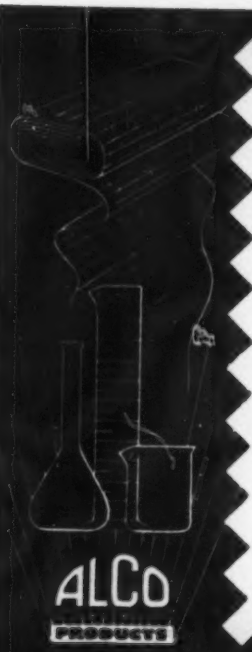
HANDLES MOST CORROSIVES

... at lower cost

ACE-ITE is a moderately priced, general-purpose, rigid plastic pipe with exceptional impact strength. For handling most inorganic acids, salts, alkalis and many organic chemicals, it's the equal of plastics that cost far more. Light weight, odorless, tasteless. Temperatures minus 40 to 170°F. Sizes ½ to 6", with fittings. Ace-Ite is only one of *eight* types of rubber and plastic pipe now made by ACE. Write today for free technical Bulletin 80.

ACE rubber and plastic processing equipment • SINCE 1852

AMERICAN HARD RUBBER COMPANY, 93 Worth St., New York 13, N. Y.



VULCANOL

The VULCANOLS REPRESENT a group of durable textile finishes which, when coated on textile fabrics, provide fiber conservation, pile anchorage, non-skid properties, slip resistance and resistance to raveling or fraying.

•

Distributors for Firestone Liberian Latex

•

Our Sales and Technical Staffs Are at Your Disposal

* Registered Trademark

ALCO PRODUCTS

ALCO OIL & CHEMICAL CORPORATION

TRENTON AVE. and WILLIAM ST., PHILADELPHIA 34, PA.

NEW ENGLAND OFFICE
Alco Oil & Chemical Corp.
610 Industrial Trust Bldg.
111 Westminster St.
Providence 3, R. I.
Phone: ELmhurst 1-5449

HIGHEST QUALITY

SODIUM SULPHIDE FLAKES

Barium's flakes dissolve into a PALE YELLOW, SEDIMENT FREE Solution denoting a minimum of IRON or other HEAVY METALS.

MANUFACTURED BY

BARIUM REDUCTION CORPORATION
South Charleston, West Virginia

PIECE-DYEING SYNTHETICS?

Find Out How Fablok ORLON* and DACRON* VERSADYE* NETS—

- Allow Complete Dye Bath Penetration To Your Product
- Simultaneously Reject Most Synthetic Dyes Themselves
- Provide Extreme Resistance to Beach Deterioration

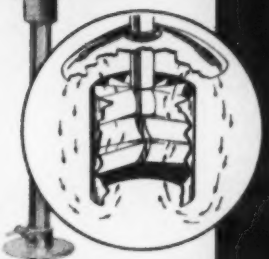
FABLOK MILLS, INC
46 Condict Street, Irvington, New Jersey

SHEAR-FLOW
INDUSTRIAL MIXER

MIXES ANYTHING THAT FLOWS!

THE MODERN MIXER FOR MODERN FINISHES

★ CUTS MIXING TIME TO 1/5th
★ DOUBLE SHEARING ACTION
★ LOW MAINTENANCE COST
★ UNIFORMITY OF MIXTURE
★ NO OPERATING TORQUE
★ QUICK CLEANING



CUTAWAY VIEW OF MIXING HEAD

GABB SPECIAL PRODUCTS

Ask about the 15-day Free Trial

DEMCO Textile Specialties Products

DEMSTA

Starch Viscosity Stabilizer

DEMSTA is used in all types of starch and gum mixes to stabilize the viscosity through changes in temperature. **DEMSTA** prevents retrogradation of starch making it possible for overnight or week-end storage. **DEMSTA** contains no enzymes or similar materials which convert or "thin" starch.

Write for samples and Information

DEMCO
Chemical Company
613 W. Ninth St. · P.O. Box 553
CHARLOTTE 1, N.C.

DESERT SUNSHINE EXPOSURE TESTS

We Test Anything Under the Sun!

ESPECIALLY COLORS
by the official A.A.T.C.C. Method
for Colorfastness-to-Sunlight

ACCURATE DEPENDABLE
4,000 hours of sunshine yearly

DESERT SUNSHINE EXPOSURE TESTS

Since 1948

7740 Ramona Road Phoenix, Ariz.

In the Valley of the Sun

TENNESSEE'S

SO_2

LIQUID

SULFUR DIOXIDE

IS EXCELLENT FOR PROCESSING

TEXTILES

An efficient reducing, bleaching, antichlor or neutralizing agent of highest quality—practically 100 per cent pure—It's easy to transport, store and handle—In your textile processing, you will do better with Tennessee's highest quality Liquid Sulfur Dioxide.

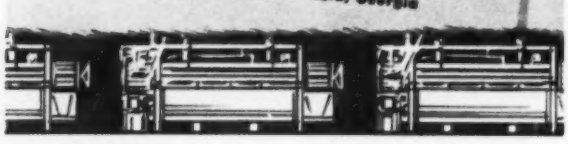
SO_2, the chemical with so many uses, can no doubt do a job for you more economically and efficiently—We would like the opportunity of discussing this with you.

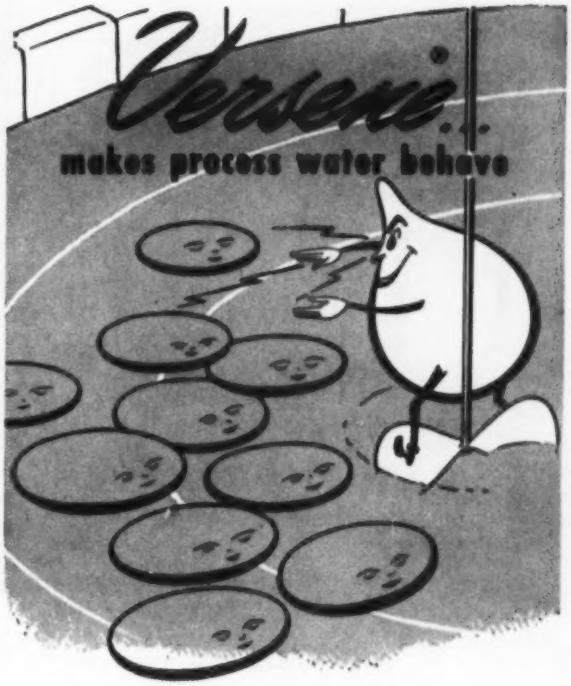
CONTAINERS: Cylinders, Ton Drums, Tank Trucks and Tank Cars.

SULFUR-DIOXIDE HIGHEST QUALITY SO_2

TENNESSEE TC CORPORATION

617-29 Grant Building, Atlanta, Georgia





WATER · THE *IMPORTANT* CHEMICAL

Few textile plants have access to water so soft that it doesn't interfere with washing, scouring, bleaching, dyeing, finishing or other wet processing operations. This is why all raw process water must be regarded as an *active chemical* until proven otherwise. Versene makes the active ingredients in process water behave and become inert. It completely and permanently softens water without forming precipitates by inactivating any calcium, magnesium, iron, copper, lead or other metal contaminants which may be present.

VERSENE · ECONOMY WITH EFFICIENCY

Textile manufacturers and processors now using the Versenes find them highly profitable in one or more wet operations. Let us show you how they can save you money.

VERSENE · A COMPLETE LINE

A complete line of basic Versene products and compounds permits chelation throughout the entire pH range. Practically any metallic contaminant may be "eliminated" with the *right* Versene. All Versene products are exceptionally stable at high temperatures throughout the pH range. Quality is unduplicated and uniformity of chelating power is guaranteed. Samples on request. Ask for Technical Bulletin No. 2. Chemical Counsel when needed.

KEY TO CHELATION

"Chemistry's most precise chemicals"

VERSENES INCORPORATED

subsidiary of THE DOW CHEMICAL COMPANY

FRAMINGHAM, MASS.

WAREHOUSE STOCKS

Chas. S. Tanner Co., 2300 No. Brevard St., Charlotte, N. Carolina
Kraft Chemical Co., Inc., 917 West 18th St., Chicago 8, Ill.
Independent Chemical Corp., One Hanson Place, Brooklyn 17, N. Y.
Borada & Page, Inc., Houston, Dallas, Corpus Christi, New Orleans, St. Louis, Wichita, Oklahoma City, Tulsa, Kansas City, Mo.
George Mann & Co., Inc., 251 Fox Point Blvd., Providence, R. I.
Braun-Knecht-Heimann Co., San Francisco, Calif.
Braun-Knecht-Heimann Co., Salt Lake City, Utah
Van Waters & Rogers, Inc., Seattle, Wash. & Portland, Ore.
Braun Corporation, Los Angeles, California
European Manufacturing Agent:
Resolinfabriken Aktiebolag, Helsingborg, Sweden

E. J. FEELEY CO.

DYESTUFFS

MANUFACTURER OF

TEXTILE CHEMICALS

263 SUMMER ST. BOSTON, MASS.

1700 WALNUT ST. PHILADELPHIA, PA.

650 STATE ST. CHARLOTTE, N. C.

AND

DISTRIBUTORS IN THE SOUTH

OF

BASES

STABLE SALTS

PYRAZOLINES (FAST DIRECT DYES)

DIPYRAZOS (DEVELOPED DYES)

COLORS FOR WOOL

MANUFACTURED

BY

PHARMA CHEMICAL CORPORATION

INDEX TO ADVERTISERS

Alco Oil & Chemical Corp. 43A
Alliance Color & Chemical Corp. .....
Althouse Chemical Co., Inc. 35A
Amalgamated Chemical Corp. .....
American Aniline Products, Inc. 3A
American Cyanamid Co. (Dyestuff Dept.) .....
American Cyanamid Co. (Tex. Resin Dept.) ..... Back Cover
American Dyestuff Reporter .....
American Hard Rubber Co. 42A
American Viscose Corp. .....
Anders Chemical Corp. .....
Antara Chemical Division of General Dyestuff Co. .....
Apex Chemical Co., Inc. .....
Arkansas Company, The 25A
Armour & Co. 6A
Arnold Hoffman & Co., Inc. 21A
Atlantic Chemical Corp. .....
Atlantic Refining Co., The 7A
Atlas Electric Devices Co. 38A
Aula Chemicals, Inc. .....
Augusta Chemical Co. .....

Barium Reduction Corp. 43A
Becco Chemical Div.
Food Machinery & Chemical Corp. 9A
Berkshire Color and Chemical Co. 10A
Bick & Co., Inc. .....
Bryant Chemical Corp. 47A
Burkart Schier Chemical Co., Inc. 36A
Burlington Engineering Co., Inc. .....
Butterworth & Sons Co., H. W. 50A

Calgon, Inc. .....
Campbell & Co., Inc., John 4A
Carbic-Moss Corp. .....
Carbide & Carbon Chemicals Co., A Division of Union Carbide and Carbon Corp. .....
Charlotte Chemical Laboratories, Inc. .....
Ciba Company, Inc. .....
Colgate-Palmolive Company .....
Columbia-Southern Chemical Corp. .....
Cravenette Co., The .....
Custom Scientific Instruments .....

Demco Chemical Co. 44A
De Paul Chemical C. 39A
Desert Sunshine Exposure Tests 44A
Dexter Chemical Corp. .....
Drew & Co., Inc., E. F. 29A
Du Pont de Nemours & Co., (Inc.) E. I.
Dyes and Chemicals Division ..... Front Cover
Electrochemicals Dept. .....
Organic Chemicals Auxiliaries 14A

Eastman Chemicals Products, Inc. .....
Emery Industries, Inc. ..... Second Cover
Emkay Chemicals Co. .....

Fablok Mills, Inc. 43A
Fancourt & Co., W. F. ..... Third Cover
Feeley Co., E. J. 46A
Foxboro Co., The .....

Gabb Special Products 44A
Gaston County Dyeing Machine Co. .....
Geigy Company, Inc. 11A, 12A
General Dyestuff Co. 19A
General Electric Co. .....
Goodrich Chemical Company, B. F. 8A
Goodyear Tire & Rubber Co. .....
Gurley, W. & L. E. .....

Harchem Div., Wallace & Tiernan, Inc. .....
Hart Products Corp., The 27A
Hercules Powder Co. .....
Hermas Machine Co. .....
Heyden Chemical Corp. 49A
Hilton-Davis Chemical Co., The 5A
Houghton & Co., E. F. .....
Hubinger & Co., The .....

Imperial Paper & Color Corp. .....
Interchemical Corp., Textile Colors Div. 17A
International Salt Co., Inc. 26A

Jersey State Chemical Co. 15A

RESIN DJ FIRMEL for the surface to penetrate

WHEN FINISHING

SCHREINERED, EMBOSSED OR FRICTIONED FABRICS

FIRMEL stays on the surface to form a glaze or hold an embossed pattern. **RESIN DJ** penetrates to lend fullness and ensure complete permanency. **COMBINING** their surface finishing and penetrating qualities, produces a formula for a wide variety of finishes of maximum permanency with a minimum of expense and operational difficulties. Send for samples.

BRYANT CHEMICAL CORPORATION, N. QUINCY 71, MASS.
or Box 2301, SPARTANBURG, S. C.

Talk about rapid absorbency for "Sanforized" fabrics!

SEYCO-SAN 66 promotes thorough, rapid, uniform absorbency in any reasonable concentration. Also effectively softens. Use alone, with starches, or most weighters. Compatible with anionic or nonionic softeners so that its action may be modified.

SEYCO-WET 49 is a straight re-wetter. You add your own softeners, or use where softness is not particularly desirable. Uniform shrinkage results.

SEYCO-SAN 26 is used where top quality is more important than a few pennies. Promotes softening, absorbency. Won't affect colors, discolor or odor.

For more information, write, wire or call, giving your specifications.

Headquarters for Textile Chemicals

SEYDEL-WOOLLEY & CO.

748 Rice Street, Atlanta, Georgia

● INDEX TO ADVERTISERS ●

Kali Mfg. Co.
Kelco Co.
Klauder Weldon Giles Machine Co.

Laurel Soap Mfg. Co., The
Le Conte & Co., Inc.
Leatex Chemical Co. 41A

Mathieson Chemicals, Olin Mathieson Chemicals Corp.
May, Inc., Otto B.
Metalsmith Div., Orange Roller Bearing Co., Inc.
Metro-Atlantic Co., Inc.
Minneapolis-Honeywell Regulator Co., Industrial Div.
Monsanto Chemical Co.
Morningstar Nicol, Inc.
Morton Salt Co.
Mutual Chemical Co. of America

National Aniline Division, Allied Chemicals & Dye Corp. 34A
National Milling & Chemical Co. 41A
National Starch Products
Naugatuck Chemical Div., of U. S. Rubber Co.
Nopco Chemical Corp. 28A
Nova Chemical Corp.
Nyanza Color & Chemical Co., Inc.

Olin Mathieson Chemicals Corp.
Industrial Chemicals Div.
Onyx Oil & Chemicals Co.
Oronite Chemical Co.

Pabst Sales Co.
Pad Dye Corp.
Pennsylvania Salt Mfg. Co.
Perkins & Sons, Inc., B. F.
Pfister Chemical Works, Inc. 32A
Pharma Chemical Corp. 46A
Philadelphia Quartz Co.
Photovolt Corp. 40A
Pittsburgh Coke & Chemical Co.
Procter & Gamble

Reading Scientific Co.
Refined Products Co.
Rohm & Haas Co. 37A
Royce Chemical Co.
Rumford Chemical Works

Sandoz Chemical Works, Inc.
Scholler Bros., Inc. 31A
Seydel-Woolley & Co. 48A
Sherwin-Williams Co.
Sims Metal Works 38A
Sirrine Co., J. E. 42A
Smith, Drum & Company
Solvay Process Division, Allied Chemical & Dye Corp.
Sou-Tex Chemical Co.
Standard Brands, Inc. 40A
Standard Chemical Products, Inc.
Stein Hall 42A
Swift & Company 13A

Taylor Instrument Companies 22A
Tennessee Corporation 45A
Tex-Chem Co.
Tinolan Co. of America, Inc.

Union Carbide & Carbon Corp.
Carbide & Chemicals Co.
U. S. Rubber Co., Naugatuck Div.

Van Vlaanderen Machine Co.
Verona Dyestuffs
Versenes, Inc. 45A
Victor Chemicals
Virginia Smelting Co.

Wallerstein Co., Inc.
Warwick Chemical Co.
Westvaco Chem. Div., Food Machinery & Chemical Corp.
Wica Chemicals, Inc. 30A
Wiesner-Rapp Co., Inc., The 23A
Wolf & Co., Jacques 16A
Wyandotte Chemicals Corp.

Young Aniline Works, Inc. 40A

Zinsser & Co., Inc. 41A

Salicylic Acid

U.S.P. CRYSTALS

A product of extremely high purity. Valued as an intermediate for the manufacture of aspirin and salicylates.

U.S.P. POWDER

Used in dusting powders, lotions and ointments for its antiseptic, fungicidal and keratolytic properties.

TECHNICAL CRYSTALS

An exceptionally pure technical sublimed product used in rubber and as a chemical intermediate for dyes and essential oils.

H POWDER

An economical unsublimed grade suitable for use in organic syntheses, rubber, and other technical applications.

We shall be happy to consult with you on your Salicylic Acid needs.

Heyden Salicylates

SODIUM SALICYLATE U.S.P.
Crystals or Powder

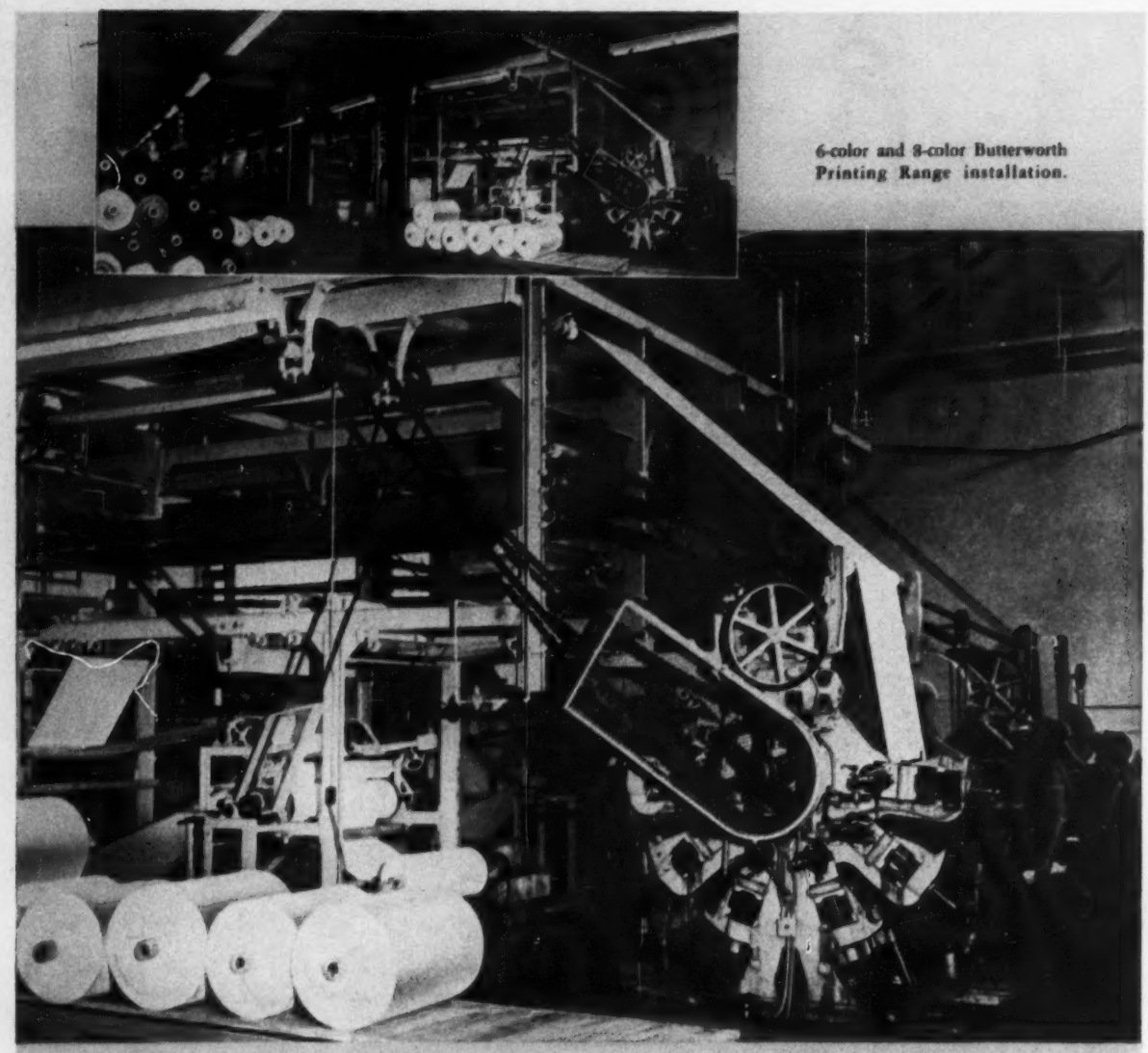
POTASSIUM SALICYLATE
Powder

METHYL SALICYLATE U.S.P.

PHENYL SALICYLATE N.F.
Granular (SALOL)

ACETYLSALICYLIC ACID U.S.P.
Crystals or Powder
(also Starch Granulations)

FINE HEYDEN CHEMICALS



6-color and 8-color Butterworth Printing Range installation.

Accurate Register . . . with precision-built Butterworth Printing Machines

Butterworth Printing Machines are designed and precision-built to permit close control of printing on cotton, silk, or synthetic fabrics. Up to 14 color shades in multiple patterns and small figure designs are registered accurately by means of precision-machined nips.

To assure smooth, high-speed operation, Butterworth Printing Machines are equipped with roller bearings . . . printing cylinder is heavy, balanced and rubber-covered . . . side frames are ruggedly constructed for long-term heavy duty. For full details, call or write —

H. W. BUTTERWORTH & SONS CO.
Bethayres, Pennsylvania
1211 Johnston Building, Charlotte, N. C.
187 Westminster Street, Providence, R. I.
Representatives in Principal Cities of the World

Machines for Bleaching, Boiling-Out, Dyeing, Mercerizing, Finishing & Embossing
Pot Spinning Machines for Synthetic Fibers
Calender Rolls : : Tenter Chains

BUTTERWORTH

VIBRALON

the formula with

"IT"

VIBRALON increases the value of nylons:

- Gives nylons a permanent matte-dull beauty!
- Makes nylons silky soft . . . while giving them that huggable, sleek look!
- Greater snag and pick resistance for longer and harder wear!
- Provides nylons with warmth and absorbency . . . gives summer comfort!

VIBRALON helps you sell more beautiful nylons at every price range. Our chemists and representatives will be glad to help you get the full benefits of this amazing finish.

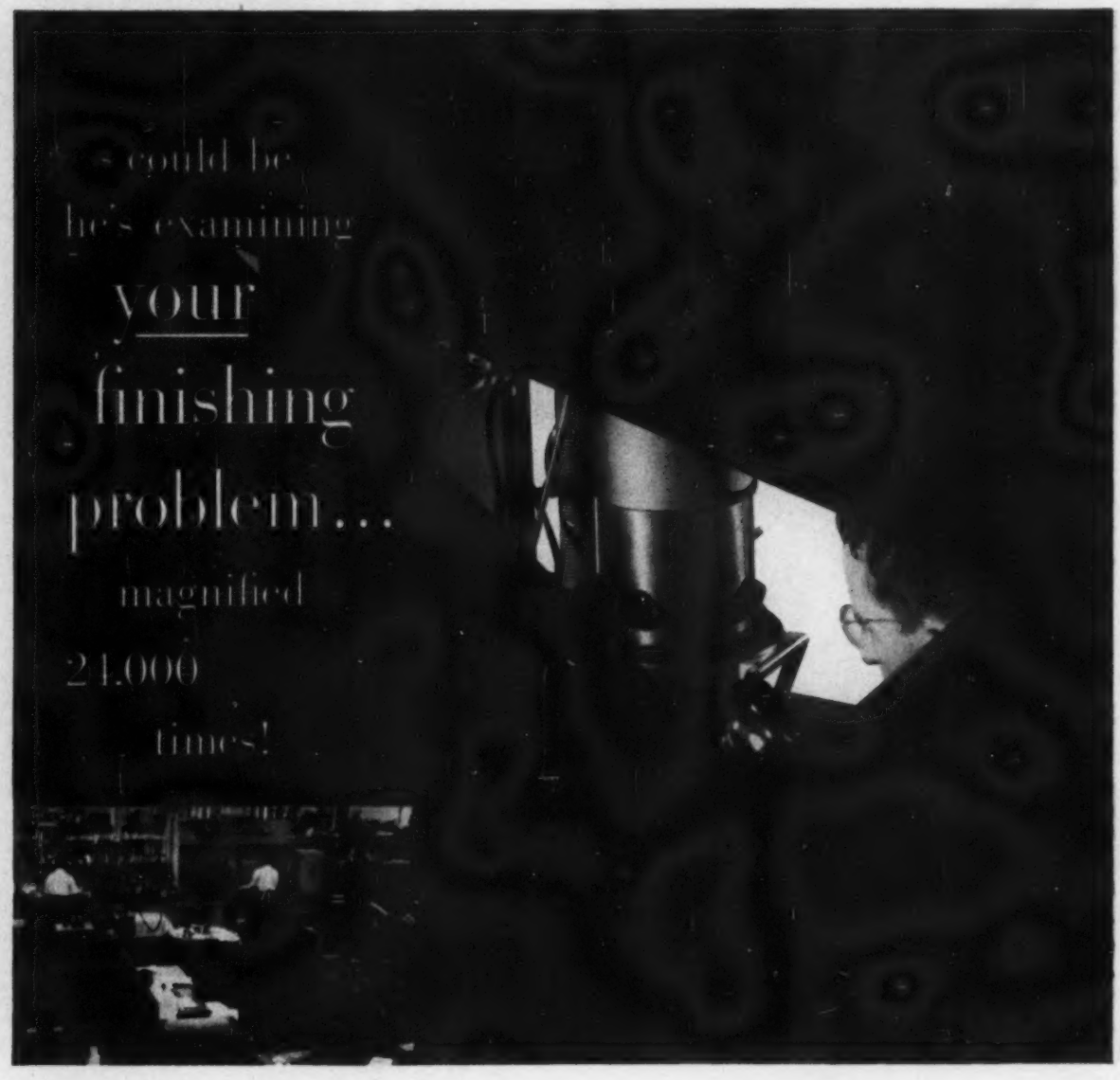
VIBRALON works wonders with LANASEAL, Fancourt's new development for improving dulling and making boarding easier.

W. F. FANCOURT CO.

518 SOUTH DELAWARE AVE.
PHILADELPHIA 47, PA.

SOLVING FINISHING PROBLEMS SINCE 1904

SOUTHERN OFFICE—846 S. MAIN ST., BURLINGTON, N. C.
CANADIAN OFFICE—CHEMTEX PRODUCTS, LTD.
168 SEATON ST., TORONTO, ONTARIO



Sometimes before we can find the right answer to a customer's finishing problem we have to see its components 24,000 times bigger than life . . . through one of the most precise diagnostic instruments in all science, the electron-microscope. This powerful and costly instrument, rare in industry, is typical of the vast and advanced technical facilities used by American Cyanamid scientists to help our customers achieve a desired textile finish. In addition to basic Cyana finishes like PERMEL® PLUS, SUPERSET®, AEROTEX®, CYANA® SHRINKAGE CONTROL, and other famous textile chemicals, our research and development laboratories produced over 10,000 *individual* finishes during the past five years alone. This accumulated experience is at your service. Working together, we may help you find just the right finish to help sell your merchandise and keep it sold. Call your Cyanamid representative today.

YOU DO BETTER WITH

AMERICAN Cyanamid COMPANY

TEXTILE RESIN DEPARTMENT

BOUND BROOK
NEW JERSEY

30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

BOSTON · PHILADELPHIA · CHICAGO · LOS ANGELES · CHARLOTTE · PROVIDENCE

North American Cyanamid Ltd., Montreal

PRODUCERS OF THE WORLD'S FINEST TEXTILE RESINS